PHPP

BRIEF INSTRUCTIONS

Place your mouse here to see the PHPP help.

If no help appears when the mouse passes over cell B4, you can activate it by going into the Menu Bar Tools/Options/View, and under "Comments", select "Comment Indicator Only".

Passive House verification: meaning of field formats

Example	Field Format	Meaning
78,8	Arial, blue, bold with yellow background	Input field: Please enter the required value here
01ud Triple-low-e Kr08	Arial Narrow, blue, with yellow background	Data entry field with drop down list
80	Arial, blue, bold with grey background	Link (through Variants-macro). Attention: do not overwrite!
6619	Arial, black, standard on white background	Calculation field; please do not change
78,8	Arial, violet, bold with white background	Field with reference to another worksheet
126,0	Arial, black, large & bold on green background	Important result

Passive House planning: worksheet directory

Worksheet name (to show/hide worksheets please use the separate 'Profile settings' tool)	Function	Brief description	Required for the certification?
Verification	Building data; summary of results	Building description, selection of the calculation method, summary of results	yes
Overview	Overview of the specific data of the project entered	In-depth project description, overview of all results and input variables, specific details on building envelope, building services systems as well as general information.	no
Cross check	Data entry assistance	Information in case PHPP does not calculate, overview of errors, plausibility checks	yes
Variants	Calculation of variants	Input parameters and results for variant calculation. Predefined fields for frequent entries, as well as user-defined area.	no
Comparison	Comparison between two variants	Comparison between two variants from the perspective of energy demand and economic viability. Input of comparison configurations.	No
Climate	Climate region selection or definition of user data	Climate data for: 'Annual heating', 'Windows', 'Heating load', 'Heating', 'Summer', 'Cooling', 'Cooling units', 'Cooling load' worksheets	yes
U-Values	Calculation of standard building assembly U-Values	Heat transmission coefficient calculations in accordance with DIN EN ISO 6946.	yes
Areas	Areas summary	Building assembly areas, thermal bridges, treated floor area. Use exterior dimension references!	yes
Ground	Calculation of reduction factors below ground	More precise calculation of heat losses through the ground	if applicable
Components	Building component database	Database of certified, Passive House suitable components and entry of user-defined components	yes
Windows	UW-Value determination	Input of geometry, orientation, frame lengths, frame widths, U_g and U-values of the frame, and the thermal bridge heat loss coefficients of the connections; from these inputs, determine U_w and total radiation.	yes
Shading	Determination of shading coefficients	Input of shading parameters, e.g. balcony, neighbouring building, window reveal and calculating the shading factors	yes
Ventilation	Air flow rates, Exhaust/Supply air balancing, Pressurization test results	Sizing the ventilation system from extract and supply air requirements, infiltration air change rate and actual efficiency of heat recovery, input of pressurization test results	yes
Addl vent	Design and planning of ventilation systems with diverse ventilation units	Extension of the 'Ventilation' worksheet for dimensioning air flows, for special building uses and systems with various ventilation units	if used
Annual heating	Annual space heating demand / Annual method	Calculation of the annual space heating demand according to the energy balance method following EN 13790: Transmission + Ventilation - h (Solar gains + Internal gains)	no
Heating	Space heating demand calculation Monthly method according to EN 13790	Calculation procedure for the monthly method following EN 13790. Make appropriate selection in the 'Verification' worksheet, if calculations should be performed following this procedure	yes
Heating Load	Building heating load calculation	Calculation of the nominal heating load using a balance procedure for the design day: max transmission + max ventilation - η (minimum solar gains + internal heat gains)	yes
SummVent	Determination of summer ventilation	Ventilation in cooling case and estimation of air flow rates for natural ventilation during the summer period	yes
Summer	Assessment of summer climate	Calculation of the frequency of overheating as a measure of summer comfort	yes
Cooling	Monthly method for cooling demand	Annual useful cooling demand calculation	if present
Cooling units	Latent cooling energy	Calculation of the energy demand for dehumidification and choice of cooling method	if present
Cooling load	Building cooling load calculation	Calculation of the daily average cooling load of the building	no
DHW+Distribution	Distribution losses; DHW requirement and losses	Heat loss calculation of the distribution systems (heating; DHW); calculation of the useful heat requirement of DHW and storage losses	yes
SolarDHW	Solar DHW heating	Solar contribution calculation for DHW and space heating contribution	if solar panels are used
PV	Electricity generation by photovoltaic	Electricity generation calculation of PV system	no
Electricity	Electricity demand for dwellings	Calculation of the electricity demand of Passive Houses with residential use	yes
Use non-res	Patterns of non-residential utilisation	Input or selection of utilisation patterns for planning of electricity demand and internal heat gains	no
Electricity non-res	Electricity demand for non-residential use	Calculation of the electricity demand for lighting, electric devices and kitchens for non-residential buildings	no
Aux Electricity	Auxiliary electricity demand	Calculation of auxiliary electricity and corresponding primary energy demand	yes
IHG	Internal heat gains in dwellings	Calculation of the internal heat gains based on the Electricity and Aux Electricity sheets.	no
IHG non-res	Internal heat gains for non-residential use	Calculation of the internal heat gains for non-residential buildings based on the 'Electricity non-res' worksheet and the occupancy	no
PER	Specific primary energy and CO_2 demands	Selection of heat generators, calculation of the primary energy and CO_2 specific demands from the present results	yes
Compact	Performance ratio of heat generator Compact heat pump unit	Calculation of the performance ratio of combined heat generation for heating and DHW by means of an electric heat pump compact unit exclusively, considering the specific project boundary conditions.	if present
HP	Performance ratio of heat generation of the heat pump	Calculation of the performance ratio for heat generation for one to two electric-run heat pumps, considering the specific project boundary conditions.	if present
HP Ground	Ground probe or ground collector in combination with a heat pump	Heat source calculation for a ground probe or horizontal subsoil heat exchanger for ground-coupled heat pumps, considering the specific project boundary conditions.	if present
Boiler	Performance ratio of heat generator Boiler	For the calculation of the performance ratio of heat generation with standard boilers (NT and calorific boilers) for the project given boundary conditions.	if present
District Heating	District heat transfer station	Calculation of the final and primary energy demands (heat)	if present
Data	Database	Table of primary energy factors following [GEMIS] and database of EnEV (German energy efficiency regulation).	No

EnerPHit Verification (step-by-step)

Calculated step:
1-Existing

Building:	Rénovation EnerPhit - Maison Mr et Mme Sauvage
Street:	3 allée des iris
Postcode/City:	69450 Saint-(
Province/Country:	France / FR-France
Building type:	Maison unifamiliale individuelle
Climate data set:	FR0004a-Lyon
Climate zone:	4: Warm-temperate — Altitude of location: 293 m
Home owner / Client:	Mr et Mme Sauvage
Street:	
Postcode/City:	
Province/Country:	

Architecture:	Atelier d'architecture Simon Teyssou
Street:	48 avenue du 15 septembre
Postcode/City:	15290 Le Roug
Province/Country:	FR-France
Energy consultancy:	Pollet Ingénierie
Street:	
Postcode/City:	
Province/Country:	

Mechanical system:	Pollet Ingénierie
Street:	
Postcode/City:	
Province/Country:	FR-France
Certification:	
Street:	
Postcode/City:	
Province/Country:	

Year of construction:	2015	Interior temperature winter [°C]:	20,0
No. of dwelling units:	1	Internal heat gains (IHG) heating case [W/m²]:	2,3
No. of occupants:	3,2	Specific capacity [Wh/K per m² TFA]:	132

Interior temp. summer [°C]:	25,0		
IHG cooling case [W/m²]:	2,3		
Mechanical cooling:			

Specific building characteristics with reference to the treated floor area

				Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area	m²	319,8			
Space heating	Heating demand	kWh/(m²a)	106	≤ 20	-	no
	Heating load	W/m²	45	≤ -	-	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	-	≤ -	-	-
	Cooling load	W/m²	-	≤ -	-	
	Frequency of overheating (> 25 °C)	%	0	≤ 10		yes
	Frequency excessively high humidity (> 12 g/kg)	%	6	≤ 20		yes
Airtightness	Pressurization test result n_{50}	1/h	5,0	≤ 1,0		no
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	318	≤ 229,743681		no
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	195	≤ -	-	-
	Generation of renewable energy	kWh/(m²a)	0	≥ -	-	

EnerPHit (refurbishment): Component characteristics

Building envelope to exterior air[1] (U-value)	W/(m²K)	0,49	≤ -
Building envelope to ground[1] (U-value)	W/(m²K)	2,42	≤ -
Wall w/int. insulation in contact w/exterior air (U-value)	W/(m²K)	-	≤ -
Wall w/interior insulation in contact w/ground (U-value)	W/(m²K)	-	≤ -
Flat roof (SRI)	-	19	≥ -
Inclined and vertical external surface (SRI)	-	19	≥ -
Windows/Entrance doors ($U_{W/D,installed}$)	W/(m²K)	2,48	≤ -
Windows ($U_{W,installed}$)	W/(m²K)	-	≤ -
Windows ($U_{W,installed}$)	W/(m²K)	-	≤ -
Glazing (g-value)	-	0,77	≥ -
Glazing/sun protection (max. solar load)	kWh/(m²a)	85	≤ -
Ventilation (effective heat recovery efficiency)	%		≥ -
Ventilation (humidity recovery efficiency)	%		≥ -

[1] Without windows, doors and external walls with interior insulation
[2] Empty field: Data missing; '-': No requirement

I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification.

EnerPHit Classic? no

Task: | First name: | Surname: | Signature:

Issued on: | City:

PHPP Check

EnerPHit with PHPP Version 9.:

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9

▼ Overview input errors

Congratulations! There are no error messages in your PHPP.

Verification	-
Climate	-
U-Values	-
Areas	-
Ground	-
Components	-
Windows	-
Shading	-
Ventilation	-
Addl vent	-
SummVent	-
Cooling units	-
DHW+Distribution	-
SolarDHW	-
PV	-
Electricity	-
Use non-res	-
Electricity non-res	-
Aux Electricity	-
IHG	-
IHG non-res	-
PER	-
Compact	-
HP	-
HP Ground	-
Boiler	-
District heating	-

▼ **Are results missing from 'Verification' worksheet? Possible causes can be found next**

Heating demand / heating load will not be calculated because:

-
-
-
-
-
-

Cooling demand / cooling load is not calculated because:

-
-
-
-
-
-
-

PE / PER specific value is not calculated because:

-
-
-

▼ **The following information is based on the energy balance calculation entered**

▼ **Plausibility check**

Variant calculation

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

		Active						
	Select the active variant here >>>>>>>	1-Existing	Existing	EnerPHit 1 : Envelope, Ventilation, Stove	EnerPHit 2 : Solar Thermal DHW	Low Energy 1 : Envelope, Stove	National Regulations	
Results	Units	1	1	2	3	4	5	6
Heating demand	kWh/(m²a)	106,5	106,5	23,5	23,5	49,1	60,3	84,9
Heating load	W/m²	45,3	45,3	13,0	13,0	24,5	30,8	31,5
Cooling & dehum. demand	kWh/(m²a)							
Cooling load	W/m²							
Frequency of overheating (> 25 °C)	%	0,0	0,0	3,8	3,8	0,0	3,4	0,0
PER demand	kWh/(m²a)	194,9	194,9	50,0	44,8	94,6	114,2	8,7
EnerPHit Classic?	yes / no	no	no	no	no	no	no	
▼ **Final energy**		-	-	-	-	-	-	-
▼ **User determined results**		-	-	-	-	-	-	-
co2 emissions	t/a	3,4	3,4	1,1	0,9	1,8	2,1	0,2
co2 tax	€/30a	7817,6	7817,6	2531,0	2144,3	4158,1	4873,5	468,7
PE demand		318,4	318,4	103,1	87,3	169,4	198,5	19,1
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
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			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0
			0,0	0,0	0,0	0,0	0,0	0,0

Input variables		Units	Value	1	2	3	4	5	6
▼ **Building assembly layers**		U-Value							
a	Exterior insulation Walls	W/(mK)	0,036	0,036	0,036	0,036	0,036	0,036	
		mm	0	0	200	200	150	0	
b	Exterior insulation Buried Walls 160 mm	W/(mK)	0,038	0,038	0,038	0,038	0,038	0,038	
		mm	0	0	80	80	40	0	
c	Exterior insulation Buried Walls 200 mm	W/(mK)	0,038	0,038	0,038	0,038	0,038	0,038	
		mm	0	0	200	200	100	0	
d	Slab not insulated - insulation under screed	W/(mK)	0,036	0,036	0,036	0,036	0,036	0,036	
		mm	0	0	0	0	0	60	
e	Exterior wall not insulated - interior insulation min wool	W/(mK)	0,032	0,032	0,032	0,032	0,032	0,032	
		mm	0	0	0	0	0	70	
f		W/(mK)	0						
		mm	0						
g		W/(mK)	0						
		mm	0						
h		W/(mK)	0						
		mm	0						
i		W/(mK)	0						
		mm	0						
j		W/(mK)	0						
		mm	0						
k		W/(mK)	0						
		mm	0						
l		W/(mK)	0						
		mm	0						
m		W/(mK)	0						
		mm	0						
n		W/(mK)	0						
		mm	0						
o		W/(mK)	0						
		mm	0						
p		W/(mK)	0						
		mm	0						
q		W/(mK)	0						
		mm	0						
r		W/(mK)	0						
		mm	0						
s		W/(mK)	0						
		mm	0						
t		W/(mK)	0						
		mm	0						
u		W/(mK)	0						
		mm	0						
v		W/(mK)	0						
		mm	0						
w		W/(mK)	0						
		mm	0						
x		W/(mK)	0						
		mm	0						
y		W/(mK)	0						
		mm	0						
z		W/(mK)	0						
		mm	0						

▼ **Radiation balance**	Areas	
▼ **Thermal bridges**	Areas	
▼ **Windows and shading**	Windows	Shading
▼ **Ventilation**	Ventilation	

Summer ventilation	SummVent
Heat generator	PER
Compressor cooling units	Cooling units
User determined parameters	

Information: New feature for experienced PHPP users (feedback welcome)!

EnerPHit with PHPP Version 9.3

Comparison between two variants

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

▼ Surface temperature ▼ Annuity ▼ Energy, CO_2, Costs ▼ Boundary conditions

Selection of comparison configuration

Description	1-EnerPHit vs Low Energy - Step 1	
Component type	5-Entire building	
Building component		

Calculation of the selected configuration

	Poorer energy efficiency	Better energy efficiency	Difference / Savings / Profit	
Design according to variant	4-Low Energy 1 : Envelope, Stove	2-EnerPHit 1 : Envelope, Ventilation, Stove		
Annual heating demand	49,128	23,542		kWh(m²a)
Minimum inside surface temperature	-	-		°C

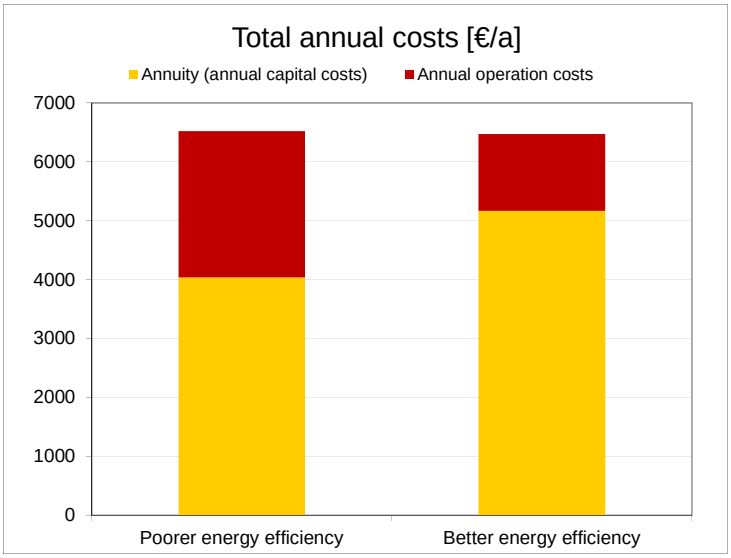
	Investment costs						
	Per m² TFA	Complete building	Per m² TFA	Complete building	Per m² TFA	Complete building	
Treated floor area (TFA)	1	320	1	320	1	320	m²
Investment costs minus financial support	284	90725	363	116150	79	25425	€
Annuity (annual capital costs)	12,6	4040	16,17	5172	**3,54**	**1132**	€/a

	Operation (heating + cooling + mechanical ventilation)						
	Per m² of TFA	Entire building	Per m² of TFA	Entire building	Per m² TFA	Complete building	
Area	1	320	1	320	1	320	m²
Heating demand	49,1	15713	23,5	7530	25,6	8184	kWh/a
Cooling + dehumidification demand							kWh/a
CO_2 emissions	4,49	1435	2,24	718	2,24	717	kg/a
Primary energy renewable (PER)	2,71	24587	0,00	0	76,87	24587	kWh/a
Annual operation costs	7,77	2486	4,07	1303	**3,70**	**1183**	€/a

	Cost-effectiveness						
Maximal economically viable additional investment costs					85,86	27462	€
Average cost for saved kWh of final energy					13,89		Cent/kWh
Total annual costs	20,40	6526	20,24	6475	**0,16**	**50,72**	€/a

Information: The cost efficiency comparison has not been implemented on the basis of single building elements

Boundary conditions					
Interest rate + inflation		Price of final energy [€/kWh]		Utilisation period [a]	
Nominal interest rate	3,0%	Electricity	0,15	Assembly layers	30
Inflation	1,0%	Gas / Oil	0,06	Vent. system	30
Period under consideration [a]	30	Wood	0,07	Thermal bridges	30
		District heating	0,10	Entire building	30
		Other	0,09	Windows	30



Input of comparison configurations

	1	2	3	4	5
Description	EnerPHit vs Low Energy - Step 1	Existing vs EnerPHit	Ventilation - EnerPHit vs L	Triple Glazing - EnerPHit v	Wall Insulation - EnerPHit
Component type	5-Entire building	5-Entire building	4-Ventilation system ('Ventilatio	3-Windows ('Windows')	1-Building assemblies ('U-values
Building component			- No additional selection	c-OF 2 Vantaux	04ud-ME - ITE 200 Ba 13
Variant "Poorer energy efficiency"	4-Low Energy 1 : Envelope, Stove	1-Existing	4-Low Energy 1 : Envelope, Sto	4-Low Energy 1 : Envelope, Sto	4-Low Energy 1 : Envelope, Stov
Investment costs [€]	90725		1500	6960	1000
Annual maintenance costs [€/a]	40	200	10		
Variant "Better energy efficiency"	2-EnerPHit 1 : Envelope, Ventilation, Stove	2-EnerPHit 1 : Envelope, Ventila	2-EnerPHit 1 : Envelope, Ventila	2-EnerPHit 1 : Envelope, Ventila	2-EnerPHit 1 : Envelope, Ventila
Investment costs [€]	116150	116150	8534	8640	1000
Annual maintenance costs [€/a]	80	80	30		
Financial support (present value) [€]					

Results (manual transfer)

Description					
	Existing	Low Energy Step 1	EnerPHit Step 1		
CO2 Tax (30 years), averaged	260,6	837,9	510,0		
Annuity Capital Cost (CAPEX)	0	4040	5172		
Operational Cost (OPEX)	5396	4117	2119		
		8994,9	7801,0		
		9%	7%		
		45%	66%		
		46%	27%		

grün und blau-grün: Ergebnisse		1-Existing	2-EnerPHit 1 : Envelope, Ventilation, Stove
blau-grün: zusammengefasste Ergebnisse		Existing	EnerPHit 1 : Envelope,
orange: Erläuterungen		1-Existing	2-EnerPHit 1 : Envelope,

Hinweise zur Verwendung 'PHeco' und 'Varianten':

jährlicher Energiebedarf (Endenergie nch Energieträger) [kWh/m²a]		e	hier 'e' für englische
Electricity (HP compact unit) (space heating) + Electricity (HP compact unit) (Domestic hot water)		0,0	0,0
Electricity (heat pump) (Space heating) + Electricity (heat pump) (Domestic hot water)		0,0	0,0
District heating: 20-Gas CGS 70% PHC (Space heating) + District heating: 20-Gas CGS 70% PHC (Domestic hot water)		0,0	0,0
Stückgutfeuerung: 44 Wood logs (space heating) + Stückgutfeuerung: 44 Wood logs (Domestic hot water)		0,0	0,0
Natural gas / RE gas (Space heating) + Natural gas / RE gas (Domestic hot water)		0,0	0,0
Heating oil / RE methanol (Space heating) + Heating oil / Methanol (Domestic hot water)		0,0	0,0
Solar thermal system (Space heating) + Solar thermal system (Domestic hot water)		0,0	0,0
Strom direkt (Space heating) + Electricity (direct) (Domestic hot water)		114,8	31,9
(Space heating) + (Domestic hot water)		0,0	0,0
Aux. electricity (circ.pump, fans, valves, frost protection, circ.pump, boiler, wood / pellets) (space heating) + Aux. electricity (circ.pump + storage charge, aux.energy DHW + solar DHW) (Domestic hot water)		1,0	1,1
Electricity cooling (heat pump) (Space cooling)		0,0	0,0
Auxiliary electricity cooling, ventilation summer (Space cooling)		0,9	0,9
Electricity dehumidification (heat pump) (Space cooling)		0,0	0,0
Auxiliary electricity (dehumidification) (Space cooling)		0,0	0,0
Electricity (household or non-residential lighting, etc.) (Electricity)		5,8	5,8
Auxiliary electricity (other) (Electricity)		0,0	0,0
Gas / RE gas dry/cook		0,0	0,0
Heating demand		106	24

jährliche Energiekosten (nach Energieträger)		
Energiekosten Wärme (Strom) [€/m²a]	23,0	6,4
Energiekosten Fernwärme [€/m²a]	0,00	0,00
Energiekosten Wärme (Erdgas) [€/m²a]	0,00	0,00
Energiekosten Wärme (Erdöl) [€/m²a]	0,00	0,00
Energiekosten Wärme (Holzpellets) [€/m²a]	0,00	0,00
Energiekosten Hilfsstrom [€/m²a] incl. Anschluss-Basis-Kosten [€/m²a]	0,19	0,21
Energiekosten Kühlung (elektro) [€/m²a]	0,2	0,2
Energiekosten el. Energie (Haushalt / Büro) [€/m²a]	1,2	1,2

Datenerhebung für ggf. notwendige Umrechnungen		
ggf Zahl der Wohn- oder Nutzungseinheiten im Gebäude	1	1
Energiebezugsfläche [m²]	320	320

Investitionskosten		
ab hier für detaillierte Kostenberechnung aufgeschlüsselte Kosten der Maßnahmen / Komponenten verschiedene Kostenarten können optional angegeben werden, Summe wird gebildet	0,00	1,00
Kosten1: [€/m² EBF] Wärmedämmung AW Außenluft	0	106
Kosten2: [€/m² EBF] Wärmedämmung Dach	0	33
Kosten3: [€/m² EBF] Wärmedämmung Kellerdecke	0	30
Kosten4: [€/m² EBF] Fenster, Türen	0	169
Kosten5: [€/m² EBF] Luftdichtheit		
Kosten Lüftung [€]		8535
Kosten Lüftung [€/m² EBF]		27
Kosten sommerliche Nachtlüftung		
Kosten som. Nachtlüftung €/m² EBF	0	0
Kosten6: [€/m² EBF] Lüftung + sommerliche Nachtlüftung	0	27
Kosten7: [€/m² EBF] Heizsystem & Warmwasser	0	14
Kosten8: [€/m² EBF] Beleuchtung	0	0
Kosten9: [€/m² EBF] XXX z.B. Sowieso-Kosten		
Zwischensumme: Kosten der Maßnahme [€/m²] (EBF)	**0**	**378**
Abschätzung des Fehlers (der Kostensumme) 7%	-	26

Wartungskosten (Haustechnik)		
Wartungskosten [€/m²a] (pauschal 1 % der Investitionskosten der Haustechnik und Fenster)	0,0	2,1

ab hier Ergebnisse (grün)		
jährliche Aufwendungen (Annuitäten)		
Barwerte (Betrachtungszeitraum 30 Jahre)		
Barwert der energiebedingten Maßnahmenkosten (30 Jahre)	0	310
Barwert Kosten für Hilfsstromverbrauch (30 Jahre)	4	5
Barwert Kosten für el. Energie (Haushalt / Büro) [€/m²] (30 Jahre)	26	26
Barwert Kosten Wartung (30 Jahre)	0	47
Barwert Kosten Endenergie Wärme [€/m²] (30 Jahre)	514	143
Barwert Kosten Endenergie Kühlung [€/m²] (30 Jahre)	4	4
Summe Lebenszykluskosten [€/m²]	**549**	**534**
Abschätzung des Fehlers (Summe) 10%	55	53

Kurzbeschreibung des Gebäudes und der wirtschaftlichen Randbedingungen für das Diagramm:

Gebäude: 320m² | Kredit: 30 Jahre, Realzins: 2% | Endenergie(Wärme): 0,2 €/kWh | Endenergie(Strom): 0,2 €/kWh | building: 320m² (TFA) | credit: 30 years, real interest: 2,00%

zum Eingeben der Finanz-Daten Zellen aufklappen

Daten für Kapitalwertberechnung		
Zinsfuß p (Realzins)	**2,00%**	2,00%
Zinsfaktor q=1+p	1,020	1,020
Kaukulationszeitraum: Laufzeit des Kredits [a]	30	30
1 / Kalkulationszeitraum	0,0333	0,0333
Annuitätenfaktor (Kalkulationszeitraum) [1/a]	0,0446	0,0446
Barwertfaktor (Kalkulationszeitraum) [a]	22,3965	22,3965
Endwertfaktor für Annuität	40,57	40,57
Lebensdauer des Bauteils / Komponente, die variiert wird	**40**	**40**
Annuitätenfaktor (für Lebensdauer)	0,0366	0,0366
Barwertfaktor (für Lebensdauer)	27,355	27,355
Restwertfaktor am Ende der Laufzeit 1/0 1	0,1813	0,1813
Endwertfaktor für Annuität (Lebensdauer)	60,40	60,40
Energiebezugspreis Endenergie Wärme [€/kWh] – Mittelwert zukünftig	**0,200**	**0,200**
Energiepreis elektrische Energie [€/kWh] – Mittelwert zukünftig	**0,200**	0,200

Climate data

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Selection of climate data

Country:	FR-France
Region:	All
	1-Alphabetic sorting
Climate data set:	FR0004a-Lyon
Climate zone:	4: Warm-temperate

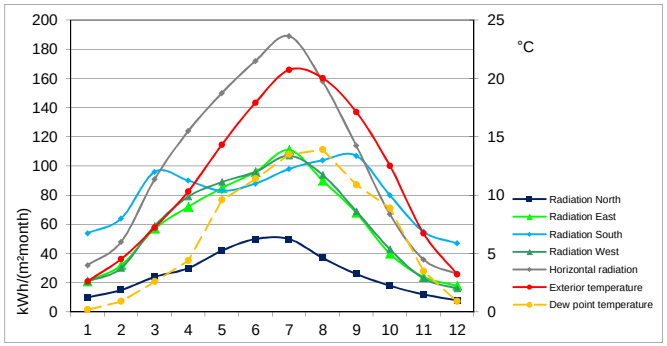
Altitude

Weather station:	299,0	m
Building location:	293	m

Result overview

Annual heating demand	106,5	kWh/(m²a)
Heating load	45,3	W/m²
Frequency of overheating	0,0	%
Sensible cooling	0,1	kWh/(m²a)
Latent cooling	0,0	kWh/(m²a)
Cooling load	-	W/m²
PER demand	194,9	kWh/(m²a)

	Data for heating Annual method	Data from monthly balance Heating	Cooling	
Heating / cooling period	191	303	153	d/a
Heating / cooling degree hours	65	79	-27	kKh/a
Radiation North	98	257	232	kWh/(m²a)
Radiation East	219	614	487	kWh/(m²a)
Radiation South	406	748	487	kWh/(m²a)
Radiation West	222	418	384	kWh/(m²a)
Horizontal radiation	349	860	783	kWh/(m²a)



	Month	1	2	3	4	5	6	7	8	9	10	11	12	Heating load		Cooling load		PER	
	Days	31	28	31	30	31	30	31	31	30	31	30	31	Weather 1	Weather 2	Weather 1	Weather 2	factors	
	FR0004a-Lyon	Latitude °	45,8	Longitude °	4,8	Altitude [m]	299	Daily temperature swing Summer [K]			10,4			Radiation: [W/m²]		Radiation: [W/m²]			
° C	Exterior temperature	2,6	4,5	7,2	10,3	14,3	17,9	20,7	20,0	17,1	12,5	6,7	3,2	-4,1	-2,5	26,0	26,0	1,25	Household electricity
kWh/(m²month)	Radiation North	10	15	24	30	42	50	50	37	26	18	12	8	25	10	100	100	1,25	Domestic hot water
kWh/(m²month)	Radiation East	21	32	57	72	85	96	111	90	68	40	24	18	40	10	170	170	1,75	Heating
kWh/(m²month)	Radiation South	54	64	96	90	83	88	98	104	107	80	55	47	85	10	180	180	1,15	Cooling
kWh/(m²month)	Radiation West	21	30	59	79	89	96	107	94	69	43	23	16	40	10	170	170	1,40	Dehumidification
kWh/(m²month)	Horizontal radiation	32	48	91	124	150	172	189	158	114	67	36	26	65	10	340	340		
° C	Dew point temperature	0,2	0,9	2,6	4,4	9,6	11,4	13,5	13,9	10,9	8,9	3,5	0,9			16,9	16,9		
° C	Sky temperature	-10,9	-9,0	-5,1	-0,9	5,6	8,1	10,6	10,4	5,7	0,7	-5,6	-10,7			14,3	16,9		
° C	Ground temperature	18,0	17,9	18,0	18,3	18,8	19,2	19,5	19,6	19,5	19,1	18,7	18,3	17,9	17,9	23,8	23,8		
	Comment:																		

U-value of building assemblies

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a

Secondary calculation: Equivalent thermal conductivity of still air spaces -> (on the right)
Wedge-shaped assembly layer -> (on the right)
Unheated / uncooled attic -> (on the right)

Assembly no. 01ud | Building assembly description: ME - Ba | Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element: 0,13 | interior R_{si}: 0,13
Adjacent to: 0,04 | exterior R_{se}: 0,04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Enduit	0,190					2
Polystyrène cellomur	0,036					0
Béton	2,000					265
Laine de verre	0,040	Rail ?				100
Ba 13	0,250					13

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 38,0 cm

U-value supplement: W/(m²K) | **U-value: 0,349** W/(m²K)

Assembly no. 02ud | Building assembly description: ME - BR | Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element: 0,13 | interior R_{si}: 0,13
Adjacent to: 0,04 | exterior R_{se}: 0,04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Enduit	0,190					2
Polystyrène cellomur	0,036					0
Béton	2,000					265
Laine de verre	0,040					50
Brique platrière	0,440					35
Enduit plâtre	0,700					15
Réno RT - ITI	0,032					0

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: 36,7 cm

U-value supplement: W/(m²K) | **U-value: 0,601** W/(m²K)

Assembly no. 03ud | Building assembly description: ME - ITE 160 Ba 13 | Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element: 0,13 | interior R_{si}: 0,13
Adjacent to: 0,04 | exterior R_{se}: 0,04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Polystyrène Polyfoam	0,038					0
Polystyrène Polyfoam	0,038					0
Béton	2,000					265
Laine de verre	0,040					100
Ba 13	0,250					13

Percentage of sec. 1	Percentage of sec. 2	Percentage of sec. 3	Total
100%			37,8 cm

U-value supplement W/(m²K)

U-value: 0,350 W/(m²K)

Assembly no. | Interior insulation?

04ud | **ME - ITE 200 Ba 13**

Heat transmission resistance [m²K/W]

Orientation of building element: 0,13 | interior R_{si}: 0,13

Adjacent to: 0,04 | exterior R_{se}: 0,04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Polystyrène cellomur	**0,036**					**0**
Béton	**2,000**					**265**
Laine de verre	**0,040**					**100**
Ba 13	**0,250**					**13**

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: **37,8** cm

U-value supplement: W/(m²K) | **U-value: 0,350** W/(m²K)

Assembly no. | Interior insulation?

05ud | **ME - RDC Ouest enterré ITE 160**

Heat transmission resistance [m²K/W]

Orientation of building element: 0,13 | interior R_{si}: 0,13

Adjacent to: 0 | exterior R_{se}: 0,00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Polystyrène Polyfoam	**0,038**					**0**
Polystyrène Polyfoam	**0,038**					**0**
Béton	**2,000**					**265**
Réno RT - ITI	**0,032**					**0**

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: **26,5** cm

U-value supplement: W/(m²K) | **U-value: 3,810** W/(m²K)

Assembly no. | Interior insulation?

06ud | **ME - RDC Ouest ITE 200**

Heat transmission resistance [m²K/W]

Orientation of building element: 0,13 | interior R_{si}: 0,13

Adjacent to: 0,04 | exterior R_{se}: 0,04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Polystyrène cellomur	**0,038**					**0**
Béton	**2,000**					**265**
Réno RT - ITI	**0,032**					**0**

Percentage of sec. 1: 100% | Percentage of sec. 2 | Percentage of sec. 3 | Total: **26,5** cm

U-value supplement: W/(m²K) | **U-value: 3,306** W/(m²K)

Assembly no. 07ud — **Plaf Buand** — Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element: 0,17 — interior R_{si}: 0,17

Adjacent to: 0,04 — exterior R_{se}: 0,04

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Styrodur	0,034					60
Béton	2,000					250
Laine de verre	0,040					250

Percentage of sec. 1: 100% — Percentage of sec. 2 — Percentage of sec. 3 — Total: 56,0 cm

U-value supplement: W/(m²K) — **U-value:** 0,120 W/(m²K)

Assembly no. 08ud — **Plaf R+1** — Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element: 0,17 — interior R_{si}: 0,17

Adjacent to: 0,17 — exterior R_{se}: 0,17

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Ouate de cellulose soufflée	0,040					150
Laine de roche	0,040					100
Laine verre	0,040	Bois	0,160			200
Brique plâtrière	0,440					35
Enduit plâtre	0,700					15
Vide technique	0,310					100
BA 13	0,250					13

Percentage of sec. 1: 90% — Percentage of sec. 2: 10,0% — Percentage of sec. 3 — Total: 61,3 cm

U-value supplement: W/(m²K) — **U-value:** 0,089 W/(m²K)

Assembly no. 09ud — **Sol isolé** — Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element: 0,17 — interior R_{si}: 0,17

Adjacent to: 0 — exterior R_{se}: 0,00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Parquet	0,160					12
Carrelage	1,150					12
Chape béton	2,000					160
Polystyrène extrudé	0,041					60
Dalle béton	2,000					160

Percentage of sec. 1: 100% — Percentage of sec. 2 — Percentage of sec. 3 — Total: 40,4 cm

U-value supplement: W/(m²K) — **U-value:** 0,532 W/(m²K)

Assembly no.		Interior insulation?
10ud	**Sol non isolé brut**	

Heat transmission resistance [m²K/W]

Orientation of building element: **0,17** — interior R_{si}: 0,17

Adjacent to: **0** — exterior R_{se}: 0,00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Chape béton	**2,000**					**130**
Dalle	**2,000**					**210**
Isolation sous chape Béno	**0,036**					**0**

Percentage of sec. 1: 100% — Percentage of sec. 2 — Percentage of sec. 3 — Total: **34,0** cm

U-value supplement: — W/(m²K)

U-value: 2,941 W/(m²K)

Assembly no.		Interior insulation?
11ud	**Sol non isolé**	

Heat transmission resistance [m²K/W]

Orientation of building element: **0,17** — interior R_{si}: 0,17

Adjacent to: **0** — exterior R_{se}: 0,00

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Carrelage	**1,150**					**10**
Carrelage	**1,150**					**12**
Chape béton	**2,000**					**130**
Dalle	**2,000**					**210**
Isolation sous chape Béno	**0,036**					**0**

Percentage of sec. 1: 100% — Percentage of sec. 2 — Percentage of sec. 3 — Total: **36,2** cm

U-value supplement: — W/(m²K)

U-value: 2,785 W/(m²K)

Assembly no.		Interior insulation?
12ud		

Heat transmission resistance [m²K/W]

Orientation of building element: — interior R_{si}: —

Adjacent to: — exterior R_{se}: —

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100% — Percentage of sec. 2 — Percentage of sec. 3 — Total: — cm

U-value supplement: — W/(m²K)

U-value: — W/(m²K)

Assembly no. 13ud

Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element

Adjacent to

interior R_{si}

exterior R_{se}:

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100%

Percentage of sec. 2

Percentage of sec. 3

Total cm

U-value supplement W/(m²K)

U-value: W/(m²K)

Assembly no. 14ud

Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element

Adjacent to

interior R_{si}

exterior R_{se}:

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100%

Percentage of sec. 2

Percentage of sec. 3

Total cm

U-value supplement W/(m²K)

U-value: W/(m²K)

Assembly no. 15ud

Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element

Adjacent to

interior R_{si}

exterior R_{se}:

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100%

Percentage of sec. 2

Percentage of sec. 3

Total cm

U-value supplement W/(m²K)

U-value: W/(m²K)

Assembly no. 16ud

Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element

Adjacent to

interior R_{si}

exterior R_{se}:

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100%

Percentage of sec. 2

Percentage of sec. 3

Total cm

U-value supplement W/(m²K)

U-value: W/(m²K)

Assembly no. 17ud

Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element

Adjacent to

interior R_{si}

exterior R_{se}:

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100%

Percentage of sec. 2

Percentage of sec. 3

Total cm

U-value supplement W/(m²K)

U-value: W/(m²K)

Assembly no. 18ud

Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element

Adjacent to

interior R_{si}

exterior R_{se}:

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100%

Percentage of sec. 2

Percentage of sec. 3

Total cm

U-value supplement W/(m²K)

U-value: W/(m²K)

Assembly no. 19ud

Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element

Adjacent to

interior R_{si}

exterior R_{se}:

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100%

Percentage of sec. 2

Percentage of sec. 3

Total cm

U-value supplement W/(m²K)

U-value: W/(m²K)

Assembly no. 20ud

Interior insulation?

Heat transmission resistance [m²K/W]

Orientation of building element

Adjacent to

interior R_{si}

exterior R_{se}:

Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]

Percentage of sec. 1: 100%

Percentage of sec. 2

Percentage of sec. 3

Total cm

U-value supplement W/(m²K)

U-value: W/(m²K)

Areas determination

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Summary

Temp.-zone	Area group	Group no.	Area / Length	Unit	Comment	Building assembly overview	Average U-value [W/(m²K)]	Radiation-gains heating season [kWh/a]	Radiation-load cooling period [kWh/a]
	Treated floor area	1	**319,85**	m²	*Treated floor area according to PHPP manual*			10 Months	5 Months
A	**North windows**	2	**10,24**	m²	Results come from the 'Windows' worksheet.	**North windows**	**2,152**	**160**	**71**
A	**East windows**	3	**16,98**	m²	Window areas are subtracted from individual opaque areas.	**East windows**	**2,499**	**1750**	**670**
A	**South windows**	4	**13,07**	m²	which is displayed in the 'Windows' worksheet.	**South windows**	**2,584**	**2091**	**704**
A	**West windows**	5	**13,98**	m²		**West windows**	**2,526**	**1401**	**591**
A	**Horizontal windows**	6	**0,00**	m²		**Horizontal windows**			
A	**Exterior door**	7	**0,00**	m²	*Please subtract area of door from respective building assembly*	**Exterior door**			
A	**External wall - Ambient**	8	**299,44**	m²	*Temperature zone "A" is ambient air*	**External wall - Ambient**	**0,780**	**1816**	**2059**
B	**External wall - Ground**	9	**55,96**	m²	*Temperature zone "B" is the ground*	**External wall - Ground**	**3,651**		
A	**Roof/Ceiling - Ambient**	10	**217,22**	m²		**Roof/Ceiling - Ambient**	**0,090**	**306**	**473**
B	**Floor slab / Basement ceiling**	11	**213,57**	m²		**Floor slab / Basement ceiling**	**2,098**		
		12	**0,00**	m²	*Temperature zones "A", "B","P" and "X" may be used. NOT "I"*				
		13	**0,00**	m²	*Temperature zones "A", "B","P" and "X" may be used. NOT "I"* Factor for X				
X		14	**0,00**	m²	*Temperature zone "X": Please provide user-defined reduction factor (0 < ft < 1):* **75%**				
						Thermal bridges - Overview	**Ψ [W/(mK)]**		
A	**Thermal bridges Ambient**	15	**216,31**	m	*Units in m*	**Thermal bridges Ambient**	**0,199**		
P	**Perimeter thermal bridges**	16	**63,51**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*	**Perimeter thermal bridges**	**0,000**		
B	**Thermal bridges FS/BC**	17	**32,82**	m	*Units in m*	**Thermal bridges FS/BC**	**0,056**		
I	**Building element towards neighbour**	18	**0,00**	m²	*No heat losses, only considered for the heating load calculation*	**Building element towards neighbour**			
Total thermal envelope			**840,45**	**m²**		**Average therm. envelope**	**1,290**		

Go to building components list

Area input

Tri: COMME LISTE

Area no.	Building assembly description	To group No.	Assigned to group	Quantity	x (	a [m]	x	b [m]	+	User determined [m²]	-	User subtraction [m²]	-	Subtraction window areas [m²]	) =	Area [m²]	Selection building assembly / Building system	U-Value [W/(m²K)]	Deviation from North	Angle of inclination from the horizontal	Orientation	Reduction factor shading	Exterior absorptivity	Exterior emissivity
	Projected building footprint	**0**	Projected building footprint	**1**	x (		x		+	**225,83**	-		)		=	225,8									
	Treated floor area	**1**	Treated floor area	**1**	x (		x		+	**319,85**	-		)		=	319,8									
	Exterior door	**7**	Exterior door	**0**	x (	**2,20**	x	**0,97**	+		-		) -		=	0,0	Exterior door	**1,22**							
1					x (		x		+		-		) -	**0,0**	=										
2	**RDC**				x (		x		+		-		) -	**0,0**	=										
3	**Sol isolé**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+	**73,81**	-		) -	**0,0**	=	73,8	**09ud Sol isolé**	**0,532**							
4	**Sol non isolé carrelé**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+	**27,04**	-		) -	**0,0**	=	27,0	**11ud Sol non isolé**	**2,785**							
5	**Sol non isolé brut**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+	**124,98**	-		) -	**0,0**	=	125,0	**10ud Sol non isolé brut**	**2,941**							
6					x (		x		+		-		) -	**0,0**	=										
7	**N1**	**9**	External wall - Ground	**1**	x (	**3,54**	x	**1,37**	+		-		) -	**0,0**	=	4,8	**06ud ME - RDC Ouest ITE 200**	**3,306**		**90**					
8	**N2**	**8**	External wall - Ambient	**1**	x (	**3,54**	x	**0,98**	+		-		) -	**0,0**	=	3,5	**06ud ME - RDC Ouest ITE 200**	**3,306**	**23**	**90**	**North**	**0,75**	**0,80**	**0,90**
9	**O1**	**9**	External wall - Ground	**1**	x (	**7,32**	x	**0,96**	+		-		) -	**0,0**	=	7,0	**05ud ME - RDC Ouest enterré ITE 160**	**3,810**		**90**					
10	**O2**	**8**	External wall - Ambient	**1**	x (	**7,32**	x	**1,99**	+		-		) -	**3,9**	=	10,7	**06ud ME - RDC Ouest ITE 200**	**3,306**	**293**	**90**	**West**	**0,75**	**0,80**	**0,90**
11	**N3**	**8**	External wall - Ambient	**1**	x (	**5,08**	x	**2,95**	+		-		) -	**5,0**	=	10,0	**04ud ME - ITE 200 Ba 13**	**0,350**	**23**	**90**	**North**	**0,75**	**0,80**	**0,90**
12	**N4**	**8**	External wall - Ambient	**1**	x (	**6,51**	x	**2,95**	+		-		) -	**2,0**	=	17,2	**02ud ME - BR**	**0,601**	**23**	**90**	**North**	**0,75**	**0,80**	**0,90**
13	**E1**	**8**	External wall - Ambient	**1**	x (	**16,62**	x	**2,95**	+		-		) -	**11,4**	=	37,7	**01ud ME - Ba**	**0,349**	**113**	**90**	**East**	**0,75**	**0,80**	**0,90**
14	**S1**	**8**	External wall - Ambient	**1**	x (	**4,54**	x	**2,95**	+		-		) -	**0,0**	=	13,4	**03ud ME - ITE 160 Ba 13**	**0,350**	**203**	**90**	**South**	**0,75**	**0,80**	**0,90**
15	**S2**	**9**	External wall - Ground	**1**	x (	**10,59**	x	**2,95**	+		-		) -	**0,0**	=	31,3	**05ud ME - RDC Ouest enterré ITE 160**	**3,810**		**90**					
16	**O3**	**9**	External wall - Ground	**1**	x (	**9,34**	x	**1,37**	+		-		) -	**0,0**	=	12,8	**06ud ME - RDC Ouest ITE 200**	**3,306**		**90**					
17	**O4**	**8**	External wall - Ambient	**1**	x (	**6,34**	x	**1,58**	+	**3,14**	-		) -	**1,8**	=	11,4	**06ud ME - RDC Ouest ITE 200**	**3,306**	**293**	**90**	**West**	**0,75**	**0,80**	**0,90**
18					x (		x		+		-		) -	**0,0**	=										
19	**R+1**				x (		x		+		-		) -	**0,0**	=										
20	**N5**	**8**	External wall - Ambient	**1**	x (	**3,54**	x	**4,08**	+		-		) -	**3,3**	=	11,2	**02ud ME - BR**	**0,601**	**23**	**90**	**North**	**0,75**	**0,80**	**0,90**
21	**O5**	**8**	External wall - Ambient	**1**	x (	**7,32**	x	**3,48**	+		-		) -	**5,3**	=	20,2	**02ud ME - BR**	**0,601**	**293**	**90**	**West**	**0,75**	**0,80**	**0,90**
22	**N6**	**8**	External wall - Ambient	**1**	x (	**11,60**	x	**3,48**	+		-		) -	**0,0**	=	40,4	**02ud ME - BR**	**0,601**	**23**	**90**	**North**	**0,75**	**0,80**	**0,90**
23	**E2**	**8**	External wall - Ambient	**1**	x (	**16,62**	x	**3,48**	+		-		) -	**5,6**	=	52,2	**02ud ME - BR**	**0,601**	**113**	**90**	**East**	**0,75**	**0,80**	**0,90**
24	**S3**	**8**	External wall - Ambient	**1**	x (	**4,33**	x	**3,48**	+		-		) -	**3,7**	=	11,4	**02ud ME - BR**	**0,601**	**203**	**90**	**South**	**0,75**	**0,80**	**0,90**
25	**S4**	**8**	External wall - Ambient	**1**	x (	**10,80**	x	**3,48**	+		-		) -	**9,4**	=	28,2	**02ud ME - BR**	**0,601**	**203**	**90**	**South**	**0,75**	**0,80**	**0,90**
26	**O6**	**8**	External wall - Ambient	**1**	x (		x		+	**35,00**	-	**0,00**	) -	**3,1**	=	31,9	**02ud ME - BR**	**0,601**	**293**	**90**	**West**	**0,75**	**0,80**	**0,90**
27	**Toiture R+1**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**223,10**	-		) -	**0,0**	=	223,1	**08ud Plaf R+1**	**0,089**	**23**	**0**	**Hor**	**1,00**	**0,80**	**0,90**
28	**Toiture buanderie**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+	**6,38**	-		) -	**0,0**	=	6,4	**07ud Plaf Buand**	**0,120**	**23**	**0**	**Hor**	**1,00**	**0,80**	**0,90**
29					x (		x		+		-		) -	**0,0**	=										

Areas determination

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Summary

Temp.-zone	Area group	Group no.	Area / Length	Unit	Comment		Building assembly overview	Average U-value [W/(m²K)]	Radiation-gains heating season [kWh/a]	Radiation-load cooling period [kWh/a]
									10 Months	5 Months
	Treated floor area	1	**319,85**	m²	*Treated floor area according to PHPP manual*					
A	**North windows**	2	**10,24**	m²			**North windows**	**2,152**	**160**	**71**
A	**East windows**	3	**16,98**	m²	Results come from the 'Windows' worksheet.		**East windows**	**2,499**	**1750**	**670**
A	**South windows**	4	**13,07**	m²	Window areas are subtracted from individual opaque areas.		**South windows**	**2,584**	**2091**	**704**
A	**West windows**	5	**13,98**	m²	which is displayed in the 'Windows' worksheet.		**West windows**	**2,526**	**1401**	**591**
A	**Horizontal windows**	6	**0,00**	m²			**Horizontal windows**			
A	**Exterior door**	7	**0,00**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**			
A	**External wall - Ambient**	8	**299,44**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0,780**	**1816**	**2059**
B	**External wall - Ground**	9	**55,96**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**3,651**		
A	**Roof/Ceiling - Ambient**	10	**217,22**	m²			**Roof/Ceiling - Ambient**	**0,090**	**306**	**473**
B	**Floor slab / Basement ceiling**	11	**213,57**	m²			**Floor slab / Basement ceiling**	**2,098**		
		12	**0,00**	m²	*Temperature zones "A", "B","P" and "X" may be used. NOT "I"*					
		13	**0,00**	m²	*Temperature zones "A", "B","P" and "X" may be used. NOT "I"*	Factor for X				
X		14	**0,00**	m²	*Temperature zone "X": Please provide user-defined reduction factor (0 < ft < 1):*	**75%**				

							Thermal bridges - Overview	**Ψ [W/(mK)]**
A	**Thermal bridges Ambient**	15	**216,31**	m	*Units in m*		**Thermal bridges Ambient**	**0,199**
P	**Perimeter thermal bridges**	16	**63,51**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0,000**
B	**Thermal bridges FS/BC**	17	**32,82**	m	*Units in m*		**Thermal bridges FS/BC**	**0,056**
I	**Building element towards neighbour**	18	**0,00**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**	
Total thermal envelope			**840,45**	**m²**			**Average therm. envelope**	**1,290**

Go to building components list

30	**Delta Surface Toiture sans ITE**	**10**	Roof/Ceiling - Ambient	**1**	x (		x		+		-	**12,26**	) -	**0,0**	=	-12,3	**08ud-Plaf R+1**	**0,089**	**90**	**90**	**East**	**1,00**	**0,80**	**0,90**
31	**Delta Surface Dalle sans ITE**	**11**	Floor slab / Basement ceiling	**1**	x (		x		+		-	**12,26**	) -	**0,0**	=	-12,3	**11ud-Sol non isolé**	**2,785**						
32					x (		x		+		-		) -	**0,0**	=									
33					x (		x		+		-		) -	**0,0**	=									
34					x (		x		+		-		) -	**0,0**	=									
35					x (		x		+		-		) -	**0,0**	=									
36					x (		x		+		-		) -	**0,0**	=									
37					x (		x		+		-		) -	**0,0**	=									
38					x (		x		+		-		) -	**0,0**	=									
39					x (		x		+		-		) -	**0,0**	=									
40					x (		x		+		-		) -	**0,0**	=									
41					x (		x		+		-		) -	**0,0**	=									
42					x (		x		+		-		) -	**0,0**	=									
43					x (		x		+		-		) -	**0,0**	=									
44					x (		x		+		-		) -	**0,0**	=									
45					x (		x		+		-		) -	**0,0**	=									
46					x (		x		+		-		) -	**0,0**	=									
47					x (		x		+		-		) -	**0,0**	=									
48					x (		x		+		-		) -	**0,0**	=									
49					x (		x		+		-		) -	**0,0**	=									
50					x (		x		+		-		) -	**0,0**	=									
Aend																									

Areas determination

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Summary

Temp.-zone	Area group	Group no.	Area / Length	Unit	Comment		Building assembly overview	Average U-value [W/(m²K)]	Radiation-gains heating season [kWh/a]
	Treated floor area	1	**319,85**	m²	*Treated floor area according to PHPP manual*				10 Months
A	**North windows**	2	**10,24**	m²			**North windows**	**2,152**	**160**
A	**East windows**	3	**16,98**	m²	Results come from the 'Windows' worksheet.		**East windows**	**2,499**	**1750**
A	**South windows**	4	**13,07**	m²	Window areas are subtracted from individual opaque areas.		**South windows**	**2,584**	**2091**
A	**West windows**	5	**13,98**	m²	which is displayed in the 'Windows' worksheet.		**West windows**	**2,526**	**1401**
A	**Horizontal windows**	6	**0,00**	m²			**Horizontal windows**		
A	**Exterior door**	7	**0,00**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**		
A	**External wall - Ambient**	8	**299,44**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0,780**	**1816**
B	**External wall - Ground**	9	**55,96**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**3,651**	
A	**Roof/Ceiling - Ambient**	10	**217,22**	m²			**Roof/Ceiling - Ambient**	**0,090**	**306**
B	**Floor slab / Basement ceiling**	11	**213,57**	m²			**Floor slab / Basement ceiling**	**2,098**	
		12	**0,00**	m²	*Temperature zones "A", "B","P" and "X" may be used. NOT "I"*				
		13	**0,00**	m²	*Temperature zones "A", "B","P" and "X" may be used. NOT "I"*	Factor for X			
X		14	**0,00**	m²	*Temperature zone "X": Please provide user-defined reduction factor (0 < ft < 1):*	**75%**			
							Thermal bridges - Overview	**Ψ [W/(mK)]**	
A	**Thermal bridges Ambient**	15	**216,31**	m	*Units in m*		**Thermal bridges Ambient**	**0,199**	
P	**Perimeter thermal bridges**	16	**63,51**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0,000**	
B	**Thermal bridges FS/BC**	17	**32,82**	m	*Units in m*		**Thermal bridges FS/BC**	**0,056**	
I	**Building element towards neighbour**	18	**0,00**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**		
Total thermal envelope			**840,45**	**m²**			**Average therm. envelope**	**1,290**	

Go to building components list

Thermal bridge inputs

No.	Thermal bridge - denomination	Group No.	Assigned to group	Quantity	x (	Length [m]	-	Subtraction length [m]	)=	Length ℓ [m]	User determined Ψ-Wert [W/(mK)]	User determined $f_{Rsi=0,25}$ (optional)	or	Selection building system	Ψ-Value [W/(mK)]	f_{Rsi}-Requirement met?
1	**Refend/Dalle isolée**	**17**	Thermal bridges FS/BC	**1**	x (	**11,35**	-		) =	11,35	**0,067**		or		**0,067**	
2	**Refend/Dalle non isolée**	**17**	Thermal bridges FS/BC	**1**	x (	**21,47**	-		) =	21,47	**0,050**		or		**0,050**	
3	**Pied de dalle ITE 200 sol isolé**	**16**	Perimeter thermal bridges	**1**	x (	**28,32**	-		) =	28,32	**0,000**		or		**0,000**	
4	**Pied de dalle enterré ITE 200**	**16**	Perimeter thermal bridges	**1**	x (	**20,15**	-		) =	20,15	**0,000**		or		**0,000**	
5	**Pied de dalle enterre ITE 160**	**16**	Perimeter thermal bridges	**1**	x (	**10,54**	-		) =	10,54	**0,000**		or		**0,000**	
6	**Pied de dalle ITE 160**	**16**	Perimeter thermal bridges	**1**	x (	**4,50**	-		) =	4,50	**0,000**		or		**0,000**	
7					x (		-		) =		**0,000**		or		**0,000**	
8	**Plancher intermédiaire**	**15**	Thermal bridges Ambient	**1**	x (	**54,87**	-		) =	54,87	**0,600**		or		**0,600**	
9	**Mur+1/Terrasse**	**15**	Thermal bridges Ambient	**1**	x (	**5,76**	-		) =	5,76	**0,000**		or		**0,000**	
10	**Mur RDC/Terrasse**	**15**	Thermal bridges Ambient	**1**	x (	**5,76**	-		) =	5,76	**0,000**		or		**0,000**	
11					x (		-		) =		**0,000**		or		**0,000**	
12	**Escalier entrée**	**15**	Thermal bridges Ambient	**1**	x (	**4,02**	-		) =	4,02	**0,891**		or		**0,891**	
13					x (		-		) =		**0,000**		or		**0,000**	
14	**Refend/mur extérieur ITI**	**15**	Thermal bridges Ambient	**1**	x (	**13,37**	-		) =	13,37	**0,082**		or		**0,082**	
15					x (		-		) =		**0,000**		or		**0,000**	
16	**Jonction ITE/ITI ITE**	**15**	Thermal bridges Ambient	**1**	x (	**4,72**	-		) =	4,72	**0,000**		or		**0,000**	
17					x (		-		) =		**0,000**		or		**0,000**	
18	**Mur R+1/Combles**	**15**	Thermal bridges Ambient	**1**	x (	**64,01**	-		) =	64,01	**0,050**		or		**0,050**	
19	**Refends/Combles**	**15**	Thermal bridges Ambient	**1**	x (	**25,40**	-		) =	25,40	**0,075**		or		**0,075**	
20					x (		-		) =		**0,000**		or		**0,000**	
21	**Angle rentrant**	**15**	Thermal bridges Ambient	**1**	x (	**29,50**	-		) =	29,50	**0,030**		or		**0,030**	
22	**Angle Sortant**	**15**	Thermal bridges Ambient	**1**	x (	**8,90**	-		) =	8,90	**-0,050**		or		**-0,050**	
23					x (		-		) =				or			
24					x (		-		) =				or			
25					x (		-		) =				or			
26					x (		-		) =				or			
27					x (		-		) =				or			
28					x (		-		) =				or			
29					x (		-		) =				or			
30					x (		-		) =				or			
31					x (		-		) =				or			
32					x (		-		) =				or			
33					x (		-		) =				or			
34					x (		-		) =				or			

Areas determination

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Summary

Temp.-zone	Area group	Group no.	Area / Length	Unit	Comment		Building assembly overview	Average U-value [W/(m²K)]	Radiation-gains heating season [kWh/a]
	Treated floor area	1	**319,85**	m²	*Treated floor area according to PHPP manual*				10 Months
A	**North windows**	2	**10,24**	m²			**North windows**	**2,152**	**160**
A	**East windows**	3	**16,98**	m²	Results come from the 'Windows' worksheet.		**East windows**	**2,499**	**1750**
A	**South windows**	4	**13,07**	m²	Window areas are subtracted from individual opaque areas.		**South windows**	**2,584**	**2091**
A	**West windows**	5	**13,98**	m²	which is displayed in the 'Windows' worksheet.		**West windows**	**2,526**	**1401**
A	**Horizontal windows**	6	**0,00**	m²			**Horizontal windows**		
A	**Exterior door**	7	**0,00**	m²	*Please subtract area of door from respective building assembly*		**Exterior door**		
A	**External wall - Ambient**	8	**299,44**	m²	*Temperature zone "A" is ambient air*		**External wall - Ambient**	**0,780**	**1816**
B	**External wall - Ground**	9	**55,96**	m²	*Temperature zone "B" is the ground*		**External wall - Ground**	**3,651**	
A	**Roof/Ceiling - Ambient**	10	**217,22**	m²			**Roof/Ceiling - Ambient**	**0,090**	**306**
B	**Floor slab / Basement ceiling**	11	**213,57**	m²			**Floor slab / Basement ceiling**	**2,098**	
		12	**0,00**	m²	*Temperature zones "A", "B","P" and "X" may be used. NOT "I"*				
		13	**0,00**	m²	*Temperature zones "A", "B","P" and "X" may be used. NOT "I"*	Factor for X			
X		14	**0,00**	m²	*Temperature zone "X": Please provide user-defined reduction factor (0 < ft < 1):*	**75%**			
							Thermal bridges - Overview	**Ψ [W/(mK)]**	
A	**Thermal bridges Ambient**	15	**216,31**	m	*Units in m*		**Thermal bridges Ambient**	**0,199**	
P	**Perimeter thermal bridges**	16	**63,51**	m	*Units in m; temperature zone "P" is perimeter (see 'Ground' worksheet)*		**Perimeter thermal bridges**	**0,000**	
B	**Thermal bridges FS/BC**	17	**32,82**	m	*Units in m*		**Thermal bridges FS/BC**	**0,056**	
I	**Building element towards neighbour**	18	**0,00**	m²	*No heat losses, only considered for the heating load calculation*		**Building element towards neighbour**		
Total thermal envelope			**840,45**	**m²**			**Average therm. envelope**	**1,290**	

Go to building components list

35					x (		-		) =								or				
36					x (		-		) =								or				
37					x (		-		) =								or				
38					x (		-		) =								or				
39					x (		-		) =								or				
40					x (		-		) =								or				
41					x (		-		) =								or				
42					x (		-		) =								or				
43					x (		-		) =								or				
44					x (		-		) =								or				
45					x (		-		) =								or				
46					x (		-		) =								or				
47					x (		-		) =								or				
48					x (		-		) =								or				
49					x (		-		) =								or				
50					x (		-		) =								or				

TBend

Heat losses through the ground

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Building section 1

Ground characteristics			
Thermal conductivity	λ	1,5	W/(mK)
Heat capacity	ρc	1,5	MJ/(m³K)
Periodic penetration depth	δ	3,17	m

Climate data			
Avg indoor temp. winter	T_i	20,0	°C
Avg indoor temp. summer	T_i	25,0	°C
Avg ground surface temperature	$T_{g,ave}$	12,5	°C
Amplitude of $T_{g,ave}$	$T_{g,\wedge}$	9,1	°C
Phase shifting of $T_{e,m}$	τ	1,2	Months
Length of the heating period	n	6,3	Months
Heating degree hours - exterior	G_t	65,4	kKh/a

Building data							
Area of ground floor slab / basement ceilin	A	73,8	m²	U-value floor slab/basement ceiling	U_f	0,532	W/(m²K)
Perimeter length	P	18,4	m	TBs floor slab / basement ceiling	Ψ_B*l	0,76	W/K
Charact. dimension of floor slab	B'	8,04	m	U-value floor slab / basement ceiling i	U_f'	0,543	W/(m²K)
				Equivalent thickness floor	d_t	2,76	m

Floor slab type (select only one)

x Slab on grade

Perimeter insulation width/depth	D	0,66	m	Orientation of perimeter insulation	horizontal	
Perimeter insulation thickness	d_n	0,16	m	(check only one field)	vertical	x
Conductivity perimeter insulation	λ_n	0,036	W/(mK)			

Heated basement or floor slab completely / partially below ground level

Basement wall height below ground level	z		m	U-Value wall below ground	U_{wB}	W/(m²K)

Unheated basement

Height aboveground wall	h		m	U-Value wall above ground	U_W	0,119 W/(m²K)
Basement wall height below ground level	z		m	U-Value wall below ground	U_{WB}	W/(m²K)
Air change unheated basement	n	0,20	h^{-1}	U-Value basement floor slab	U_{fB}	W/(m²K)
Air flow basement	V		m³			

Suspended floor above a ventilated crawl space (at max. 0.5 m below ground)

U-Value crawl space	U_{Crawl}		W/(m²K)	Area of ventilation openings	εP	m²
Height of crawl space wall	h		m	Wind velocity at 10 m height	v	4,0 m/s
U-Value crawl space wall	U_W		W/(m²K)	Wind shield factor	f_W	0,05 -

Additional thermal bridge heat losses at perimeter						
				Steady-state fraction	$\Psi_{P,stat}$*l	2,074 W/K
Phase shift	β		Months	Harmonic fraction	$\Psi_{P,harm}$*l	2,074 W/K

Groundwater correction							
Depth of the groundwater table	z_w	3,0	m	Groundwater correction factor	G_w	1,06800228	-
Groundwater flow rate	q_w	0,05	m/d				

Interim results

Phase shift	β	1,18	Months	Steady-state heat flow	Φ_{stat}	145,5	W
Steady-state transmittance	L_S	19,28	W/K	Periodic heat flow	Φ_{harm}	36,9	W
Exterior periodic transmittance	L_{pe}	8,22	W/K	Heat losses during heating period	Q_{tot}	835	kWh
Transmittance building	L_0	42,12	W/K				

Monthly average temperatures in the ground for monthly method (building assembly 1)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Avg. value
Winter	15,2	14,8	14,9	15,4	16,2	17,1	17,9	18,3	18,2	17,7	16,9	16,0	16,5
Summer	17,9	17,5	17,6	18,1	18,9	19,9	20,6	21,0	20,9	20,4	19,6	18,7	19,3

Design ground temperature for 'Heating load' worksheet 14,8 **For 'Cooling load' worksheet** 21,0

Reduction factor for 'Annual heating' worksheet 0,30

Total result (all building parts)

Phase shift	β	0,76	Months	Steady-state heat flow	Φ_{stat}	614,3	W
Steady-state transmittance	L_S	81,39	W/K	Periodic heat flow	Φ_{harm}	233,9	W
Exterior periodic transmittance	L_{pe}	46,15	W/K	Heat losses during heating period	Q_{tot}	3882	kWh
Transmittance building	L_0	488,56	W/K	Charact. dimension of floor slab	B'	7,11	m

Monthly Average temperatures in the ground for monthly method (all building assemblies)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Avg. value
Winter	**18,0**	**17,9**	**18,0**	**18,3**	**18,8**	**19,2**	**19,5**	**19,6**	**19,5**	**19,1**	**18,7**	**18,3**	**18,7**
Summer	**22,2**	**22,1**	**22,2**	**22,5**	**22,9**	**23,4**	**23,7**	**23,8**	**23,6**	**23,3**	**22,9**	**22,5**	**22,9**

Design ground temperature for 'Heating load' worksheet **17,9** **For 'Cooling load' worksheet** **23,8**

Reduction factor for 'Annual heating' worksheet **0,12**

Heat losses through the ground 2

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Building section 2

Ground characteristics			
Thermal conductivity	λ	1,5	W/(mK)
Heat capacity	ρc	1,5	MJ/(m³K)
Periodic penetration depth	δ	3,17	m

Building data							
Area of ground floor slab / basement ceiling	A	27,0	m²	U-value floor slab/basement ceiling	U_f	2,785	W/(m²K)
Perimeter length	P	9,3	m	TBs floor slab / basement ceiling	Ψ_B*l		W/K
Charact. dimension of floor slab	B'	5,81	m	U-value floor slab / basement ceiling i	U_f'	2,785	W/(m²K)
				Equivalent thickness floor	d_t	0,54	m

Floor slab type (select only one)							
x	**Slab on grade**						
	Perimeter insulation width/depth	D	0,66	m	Orientation of perimeter insulation	horizontal	
	Perimeter insulation thickness	d_n	0,16	m	(check only one field)	vertical	x
	Conductivity perimeter insulation	λ_n	0,036	W/(mK)			
	Heated basement or floor slab completely / partially below ground level						
	Basement wall height below ground level	z		m	U-Value wall below ground	U_{wB}	W/(m²K)
	Unheated basement						
	Height aboveground wall	h		m	U-Value wall above ground	U_W	W/(m²K)
	Basement wall height below ground level	z		m	U-Value wall below ground	U_{WB}	W/(m²K)
	Air change unheated basement	n	0,20	h^{-1}	U-Value basement floor slab	U_{fB}	W/(m²K)
	Air flow basement	V		m³			
	Suspended floor above a ventilated crawl space (at max. 0.5 m below ground)						
	U-Value crawl space	U_{Crawl}		W/(m²K)	Area of ventilation openings	εP	m²
	Height of crawl space wall	h		m	Wind velocity at 10 m height	v	4,0 m/s
	U-Value crawl space wall	U_W		W/(m²K)	Wind shield factor	f_W	0,05 -

Additional thermal bridge heat losses at perimeter						
				Steady-state fraction	$\Psi_{P,stat}$*l	1,247 W/K
Phase shift	β		Months	Harmonic fraction	$\Psi_{P,harm}$*l	1,247 W/K

Groundwater correction							
Depth of the groundwater table	z_w	3,0	m	Groundwater correction factor	G_w	1,04684793	-
Groundwater flow rate	q_w	0,05	m/d				

Interim results

Phase shift	β	0,69	Months	Steady-state heat flow	Φ_{stat}	94,2	W
Steady-state transmittance	L_S	12,48	W/K	Periodic heat flow	Φ_{harm}	43,6	W
Exterior periodic transmittance	L_{pe}	8,47	W/K	Heat losses during heating period	Q_{tot}	631	kWh
Transmittance building	L_0	76,54	W/K				

Monthly average temperatures in the ground for monthly method (building assembly 2)

Month	1	2	3	4	5	6	7	8	9	10	11	12	Avg. value
Winter	17,9	17,8	17,9	18,3	18,8	19,3	19,7	19,8	19,6	19,2	18,7	18,2	18,8
Summer	22,1	22,0	22,1	22,5	23,0	23,5	23,9	24,0	23,8	23,4	22,9	22,4	23,0

Design ground temperature for 'Heating load' worksheet 17,8 — **For 'Cooling load' worksheet** 24,0

Reduction factor for 'Annual heating' worksheet 0,13

Passive House Components

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 k

Go to: 'AREAS' | www.passivehouse.com/component-database
Thermal bridges (Psi-values) | Ventilation units
Glazing | Compact units
Window frame | Heat recovery DHW

Building assemblies (U-Values)

Recommended starting values for optimisation: U-values for walls and roofs | Floor slabs: 0,3 W/(m²K) | 0,54 W/(m²K)

		1			
ID	**Building system**	**Building assembly**	**Total thickness**	**U-Value**	**Interior insulation**
	Summary of the constructions calculated in 'U values' worksheet		m	W/(m²K)	-
01ud	**ME - Ba**	**ME - Ba**	**0,380**	**0,349**	**0**
02ud	**ME - BR**	**ME - BR**	**0,367**	**0,601**	**0**
03ud	**ME - ITE 160 Ba 13**	**ME - ITE 160 Ba 13**	**0,378**	**0,350**	**0**
04ud	**ME - ITE 200 Ba 13**	**ME - ITE 200 Ba 13**	**0,378**	**0,350**	**0**
05ud	**ME - RDC Ouest enterré ITE 160**	**ME - RDC Ouest enterré ITE 160**	**0,265**	**3,810**	**0**
06ud	**ME - RDC Ouest ITE 200**	**ME - RDC Ouest ITE 200**	**0,265**	**3,306**	**0**
07ud	**Plaf Buand**	**Plaf Buand**	**0,560**	**0,120**	**0**
08ud	**Plaf R+1**	**Plaf R+1**	**0,613**	**0,089**	**0**
09ud	**Sol isolé**	**Sol isolé**	**0,404**	**0,532**	**0**
10ud	**Sol non isolé brut**	**Sol non isolé brut**	**0,340**	**2,941**	**0**
11ud	**Sol non isolé**	**Sol non isolé**	**0,362**	**2,785**	**0**
12ud					
13ud					
14ud					
15ud					
16ud					
17ud					
18ud					
19ud					
20ud					
21ud					
22ud					
23ud					
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46ud					
47ud					
48ud					
49ud					
50ud					
51ud					
52ud					

Building assemblies (U-Values)

Recommended starting values for optimisation: U-values for walls and roofs | Floor slabs: 0,3 W/(m²K) | 0,54 W/(m²K)

		1			
ID	**Building system**	**Building assembly**	**Total thickness**	**U-Value**	**Interior insulation**
	Summary of the constructions calculated in 'U values' worksheet		m	W/(m²K)	-
53ud					
54ud					
55ud					
56ud					
57ud					
58ud					
59ud					
60ud					
61ud					
62ud					
63ud					
64ud					
65ud					
66ud					
67ud					
68ud					
69ud					
70ud					
71ud					
72ud					
73ud					
74ud					
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79ud					
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81ud					
82ud					
83ud					
84ud					
85ud					
86ud					
87ud					
88ud					
89ud					
90ud					
91ud					
92ud					
93ud	HLZ24-Altb	HLZ24-Altb	0,275	1,440	
94ud	Brique pleine38-Altb	Brique pleine38-Altb	0,415	1,640	
95ud	Colombage18-Altb	Colombage18-Altb	0,210	1,800	
96ud	HLZ30-Altb	HLZ30-Altb	0,335	1,230	
97ud	Altb-Élément préfabriqué en béton	Altb-Élément préfabriqué en béton	0,275	1,300	
98ud	Altb-Plancher gîtage bois	Altb-Plancher gîtage bois	0,284	0,990	
99ud	Altb-Plafond sur cave	Altb-Plafond sur cave	0,242	1,230	

Glazing

Glazing

	Recommended glazing type to start planning: Triple thermally insulated glazing (Please consider the comfort criterion!)		
ID	**Description**	**g-Value**	**U_g-Value**
			W/(m²K)
01ud	**Triple vitrage 1**	**0,53**	**0,53**
02ud	**Triple vitrage feuilleté**	**0,50**	**0,58**
03ud	**Double vitrage**	**0,60**	**1,10**
04ud	**Triple vitrage TRIIE**	**0,63**	**0,64**
05ud			
06ud	**porte garage**	**0,00**	**1,30**
07ud			
08ud			
09ud			
10ud			
11ud			
12ud			
13ud			
14ud			
15ud			
16ud			
17ud			
18ud			
19ud			
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46ud			
47ud			
48ud			
49ud			
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51ud			
52ud			
53ud			
54ud			
55ud			
56ud			
57ud			
58ud			
59ud			
60ud			

Glazing			Glazing
	Recommended glazing type to start planning: Triple thermally insulated glazing (Please consider the comfort criterion!)		
ID	Description	g-Value	U_g-Value
			W/(m²K)
61ud			
62ud			
63ud			
64ud			
65ud			
66ud			
67ud			
68ud			
69ud			
70ud			
71ud			
72ud			
73ud			
74ud			
75ud			
76ud			
77ud			
78ud			
79ud			
80ud			
81ud			
82ud			
83ud			
84ud			
85ud			
86ud			
87ud			
88ud			
89ud			
90ud			
91ud			
92ud	**Simple vitrage**	**0,87**	**5,80**
93ud	**Double vitrage isolant 4/12mmair/4**	**0,77**	**2,90**
94ud	**Double vitrage isolant 4/16mmair/4**	**0,77**	**2,70**
95ud	**Double vitrage isolant 4/20mmair/4**	**0,77**	**2,80**
96ud	**Double vitrage isolant 4/25mmair/4**	**0,77**	**2,80**
97ud	**Double vitrahe isolant 4/30mmair/4**	**0,77**	**2,80**
98ud	**Triple vitrage isloant 4/10air/4/10air/4**	**0,70**	**2,00**
99ud	**2-fach WSVG 4/16Argon90%/4 Epsilon=0.1**	**0,64**	**1,30**

Window frame

Window frame

		U_f-Value				Frame width				Glazing edge thermal bridge				Installation thermal bridge				Curtain wall facades:
ID	Description	left	right	bottom	above	left	right	bottom	above	$\Psi_{Glazing\ edge}$ left	$\Psi_{Glazing\ edge}$ right	$\Psi_{Glazing\ edge}$ bottom	$\Psi_{Glazing\ edge}$ top	$\Psi_{Installation}$ left	$\Psi_{Installation}$ right	$\Psi_{Installation}$ bottom	$\Psi_{Installation}$ top	χ_{GC} -value Glass carrier
		W/(m²K)	W/(m²K)	W/(m²K)	W/(m²K)	m	m	m	m	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/K
01ud	**Smartwinfix**	**0,54**	**0,54**	**0,77**	**0,54**	**0,086**	**0,086**	**0,086**	**0,086**	**0,028**	**0,028**	**0,027**	**0,028**	**0,017**	**0,017**	**0,040**	**0,040**	
02ud	**Smartwin**	**0,70**	**0,70**	**0,91**	**0,70**	**0,086**	**0,086**	**0,086**	**0,086**	**0,028**	**0,028**	**0,025**	**0,028**	**0,017**	**0,017**	**0,040**	**0,040**	
03ud	**Climatop eco**	**1,12**	**1,12**	**1,12**	**1,12**	**0,140**	**0,140**	**0,140**	**0,140**	**0,030**	**0,030**	**0,030**	**0,030**	**0,017**	**0,017**	**0,100**	**0,040**	
04ud	**Smartwin avec seuil PMR**	**0,70**	**0,70**	**1,10**	**0,70**	**0,086**	**0,086**	**0,086**	**0,086**	**0,028**	**0,028**	**0,027**	**0,028**	**0,017**	**0,017**	**0,040**	**0,040**	
05ud	**Smartwin avec seuil PMR et mullion**	**0,70**	**0,82**	**1,10**	**0,70**	**0,086**	**0,055**	**0,086**	**0,086**	**0,028**	**0,028**	**0,027**	**0,028**	**0,017**	**0,017**	**0,040**	**0,040**	
06ud	**Porte garage**	**1,30**	**1,30**	**1,30**	**1,30**	**0,100**	**0,100**	**0,100**	**0,100**	**0,000**	**0,000**	**0,000**	**0,000**	**0,200**	**0,200**	**0,200**	**0,200**	
07ud	**Smartwinfix mullion**	**0,54**	**0,82**	**0,77**	**0,54**	**0,086**	**0,055**	**0,086**	**0,086**	**0,028**	**0,028**	**0,027**	**0,028**	**0,017**	**0,017**	**0,040**	**0,040**	
08ud	**Smartwin mullion**	**0,70**	**0,82**	**0,91**	**0,70**	**0,086**	**0,055**	**0,086**	**0,086**	**0,028**	**0,028**	**0,025**	**0,028**	**0,017**	**0,017**	**0,040**	**0,040**	
09ud	**Smartwin 2 mullions**	**0,82**	**0,82**	**0,91**	**0,70**	**0,055**	**0,055**	**0,086**	**0,086**	**0,028**	**0,028**	**0,025**	**0,028**	**0,017**	**0,017**	**0,040**	**0,040**	
10ud	**Chassis Alu BBC Mise en Œuvre Nu extérieur avec faible retour isolant**	**1,90**	**1,90**	**1,90**	**1,90**	**0,090**	**0,090**	**0,090**	**0,090**	**0,060**	**0,060**	**0,060**	**0,060**	**0,060**	**0,060**	**0,080**	**0,150**	
11ud																		
12ud																		
13ud																		
14ud																		
15ud																		
16ud																		
17ud																		
18ud																		
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44ud																		
45ud																		
46ud																		
47ud																		
48ud																		
49ud																		
50ud																		
51ud	**Châssis passifs: qualité thermique moyenne**	**0,75**	**0,75**	**0,75**	**0,75**	**0,140**	**0,140**	**0,140**	**0,140**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	
52ud	**Châssis passif: bonne qualité thermique**	**0,72**	**0,72**	**0,72**	**0,72**	**0,140**	**0,140**	**0,140**	**0,140**	**0,035**	**0,035**	**0,035**	**0,035**	**0,040**	**0,040**	**0,040**	**0,040**	
53ud	**Existant: bois 45 mm**	**2,50**	**2,50**	**2,50**	**2,50**	**0,140**	**0,140**	**0,140**	**0,140**	**0,050**	**0,050**	**0,050**	**0,050**	**0,040**	**0,040**	**0,040**	**0,040**	
54ud	**Existant: bois 68 mm**	**1,60**	**1,60**	**1,60**	**1,60**	**0,140**	**0,140**	**0,140**	**0,140**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	
55ud	**Existant: PVC bonne qualité**	**1,60**	**1,60**	**1,60**	**1,60**	**0,140**	**0,140**	**0,140**	**0,140**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	
56ud	**Existant: PVC jusque 1998**	**1,80**	**1,80**	**1,80**	**1,80**	**0,140**	**0,140**	**0,140**	**0,140**	**0,050**	**0,050**	**0,050**	**0,050**	**0,040**	**0,040**	**0,040**	**0,040**	
57ud	**Existant: PVC avant 1972**	**2,20**	**2,20**	**2,20**	**2,20**	**0,140**	**0,140**	**0,140**	**0,140**	**0,050**	**0,050**	**0,050**	**0,050**	**0,040**	**0,040**	**0,040**	**0,040**	
58ud	**Existant: métallique, avec rupture thermique**	**2,40**	**2,40**	**2,40**	**2,40**	**0,140**	**0,140**	**0,140**	**0,140**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	**0,040**	
59ud	**Existant: métallique, sans rupture thermique**	**4,50**	**4,50**	**4,50**	**4,50**	**0,140**	**0,140**	**0,140**	**0,140**	**0,030**	**0,030**	**0,030**	**0,030**	**0,040**	**0,040**	**0,040**	**0,040**	
60ud	**Existant: métallique, sans rupture thermique, laqué**	**5,50**	**5,50**	**5,50**	**5,50**	**0,140**	**0,140**	**0,140**	**0,140**	**0,030**	**0,030**	**0,030**	**0,030**	**0,040**	**0,040**	**0,040**	**0,040**	

Window frame

		U_f-Value				Frame width				Glazing edge thermal bridge				Installation thermal bridge				Curtain wall facades:
ID	Description	left	right	bottom	above	left	right	bottom	above	$\Psi_{Glazing\ edge}$ left	$\Psi_{Glazing\ edge}$ right	$\Psi_{Glazing\ edge}$ bottom	$\Psi_{Glazing\ edge}$ top	$\Psi_{Installation}$ left	$\Psi_{Installation}$ right	$\Psi_{Installation}$ bottom	$\Psi_{Installation}$ top	χ_{GC} -value Glass carrier
		W/(m²K)	W/(m²K)	W/(m²K)	W/(m²K)	m	m	m	m	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/(mK)	W/K
61ud	Raccord: bois non isolé, maçonnerie non isolée													0,088				
62ud	Raccord: bois non isolé, recouvert avec 6 cm de crépi sur isolant													0,002				
63ud	Raccord: PVC non isolé, maçonnerie non isolée													0,088				
64ud	Raccord: PVC non isolé, recouvert avec 6 cm de crépi sur isolant													0,002				
65ud	Raccord: métallique, sans rupture thermique maçonnerie non isolée													0,088				
66ud	Raccord: bois isolé, crépi sur isolant, épaisseur d'isolation													0,009				
67ud	Raccord: bois isolé, crépi sur isolant, partiellement appuié sur maçonnerie													0,021				
68ud	Raccord: bois isolé, crépi sur isolant, extérieur à fleur avec maçonnerie													0,076				
69ud	Raccord: bois isolé, paroi légère en bois (optimal)													0,009				
70ud	Raccord: bois isolé, Bloc de coffrage en béton (optimal)													0,001				
71ud	Raccord: PVC isolé, crépi sur isolant, épaisseur d'isolation													0,009				
72ud	Raccord: PVC isolé, crépi sur isolant, partiellement appuié sur maçonnerie													0,021				
73ud	Raccord: PVC isolé, crépi sur isolant, extérieur à fleur avec maçonnerie													0,076				
74ud	Raccord: PVC isolé, paroi légère en bois (optimal)													0,009				
75ud	Raccord: PVC isolé, Bloc de coffrage en béton (optimal)													0,001				
76ud	Raccord: bois-alu isolé, crépi sur isolant, épaisseur d'isolantion													0,013				
77ud	Raccord: bois-alu isolé, crépi sur isolant, partiellement appuié sur maçonnerie													0,023				
78ud	Raccord: bois-alu isolé, paroi légère en bois (centré)													0,013				
79ud	Raccord: bois-alu isolé, Bloc de coffrage en béton (optimal)													0,002				
80ud	Raccord: bois-alu isolé, Bloc de coffrage en béton (déplacé vers l'intérieur)													0,013				
81ud	Raccord: bois-alu isolé, profilé alu raccourci, crépi sur isolant, épaisseur d'isolation													0,002				
82ud	Raccord: bois-alu isolé, profilé alu raccourci, paroi légère en bois (centré)													0,010				
83ud	Raccord: bois-alu isolé, profilé alu raccourci, Bloc de coffrage en béton (optimal)													0,006				
84ud	Raccord: bois-alu isolé, profilé alu raccourci, Bloc de coffrage en béton (centré)													0,013				
85ud	Mur rideau: bois extérieur devant la façade													0,343				
86ud	Mur rideau: bois extérieur à fleur avec la façade													0,036				
87ud	Mur rideau: bois dans l'épaisseur d'isolation													0,034				
88ud	Mur rideau: bois entre isolation et paroi													0,059				
89ud	Mur rideau: bois intérieur à fleur avec l'isolation													0,397				
90ud	Mur rideau: acier extérieur devant la façade													0,666				
91ud	Mur rideau: acier extérieur à fleur avec l'isolation													0,047				
92ud	Mur rideau: acier dans l'épaisseur d'isolation													0,044				
93ud	Mur rideau: acier entre isolation et paroi													0,062				
94ud	Mur rideau: acier intérieur à fleur avec l'isolation													0,409				
95ud	Mur rideau: alu extérieur devant la façade													0,747				
96ud	Mur rideau: alu extérieur à fleur avec l'isolation													0,056				
97ud	Mur rideau: alu dans l'épaisseur d'isolation													0,053				
98ud	Mur rideau: alu entre isolation et paroi													0,070				
99ud	Mur rideau: alu intérieur à fleur avec l'isolation													0,421				

Ventilation units with heat recovery

Ventilation units with heat recovery

	Recommended specifications to start planning: Frost protection: Yes; Humidity recovery: Yes	75 %		0,45	Additional Device Data								
ID	Description	Effective heat recovery efficiency	Energy recovery value η_{ER}	Electric efficiency	Application range		External pressure per section	Fittings Dp_{intern}	Frost protection necessary	Noise protection			Additional info
	User defined area	%	%	Wh/m³	m³/h	m³/h	Pa	Pa		35 dB(A)	Supply air dB(A)	Extract air dB(A)	
01ud	**Genvex energy S > 183 m3/h**	**79%**		**0,42**	**74**	**184**							
02ud	**Genvex energy S <153 m3/h**	**87%**		**0,39**	**74**	**153**							
03ud	**Supply air mechanical ventilation**	**0%**		**0,25**									
04ud													
05ud													
06ud													
07ud													
08ud													
09ud													
10ud													
11ud													
12ud													
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60ud													

Ventilation units with heat recovery

Ventilation units with heat recovery

	Recommended specifications to start planning: Frost protection: Yes; Humidity recovery: Yes	75 %		0,45	Additional Device Data								
ID	Description	Effective heat recovery efficiency	Energy recovery value η_{ER}	Electric efficiency	Application range		External pressure per section	Fittings Dp_{intern}	Frost protection necessary	Noise protection			Additional info
	User defined area	%	%	Wh/m³	m³/h	m³/h	Pa	Pa		35 dB(A)	Supply air dB(A)	Extract air dB(A)	
61ud													
62ud													
63ud													
64ud													
65ud													
66ud													
67ud													
68ud													
69ud													
70ud													
71ud													
72ud													
73ud													
74ud													
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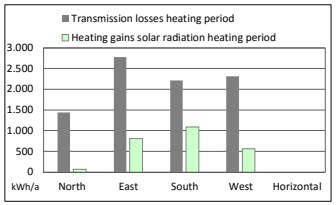
88ud													
89ud													
90ud													
91ud													
92ud													
93ud													
94ud													
95ud													
96ud													
97ud	**par défaut**	**75%**		**0,45**									
98ud	**Ventilation à extraction simple**	**0%**		**0,25**									
99ud	Compact unit selected in 'Compact' worksheet												

Windows

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Window area orientation	Global radiation (main orientations)	Shading	Dirt	Non-vertical radiation incidence	Glazing fraction	g-Value	Solar irradiation reduction factor	Window area	Window U-Value	Glazing area	Average global radiation		Transmission losses heating period	Heating gains solar radiation heating period
Standard values →	kWh/(m²a)	0,75	0,95	0,85				m²	W/(m²K)	m²	kWh/(m²a)		kWh/a	kWh/a
North	98	0,31	0,95	0,85	0,72	0,34	0,18	10,24	2,15	7,38	105	North	1442	66
East	219	0,52	0,95	0,85	0,52	0,77	0,22	16,98	2,50	8,87	284	East	2776	811
South	406	0,54	0,95	0,85	0,63	0,77	0,28	13,07	2,58	8,25	390	South	2210	1089
West	222	0,70	0,95	0,85	0,55	0,77	0,31	13,98	2,53	7,65	167	West	2310	558
Horizontal	349	1,00	0,95	0,85	0,00	0,00	0,00	0,00	0,00	0,00	349	Horizontal	0	0
Total or average value for all windows.						0,67	0,25	54,28	2,46	32,14			8739	2523



Heating degree hours [kKh/a: 65,4

Go to glazing list Go to window frames list

Qua n- tity	Description	Window rough openings: Deviation from north	Window rough openings: Angle of inclination from the horizontal	Window rough openings: Orien- tation	Window rough openings: Width	Window rough openings: Height	Installed in: Selection from 'Areas' worksheet	Glazing: Selection from 'Components' worksheet	Frame: Selection from 'Components' worksheet	g-Value: Perpen- dicular radiation	U-Value: Glazing	U-Value: Frames (avg.)	Ψ Glazing edge (Avg.)	Installation situation: left	right	bottom	top	Ψinstallation (Avg.)	Results: Window Area	Glazing area	Uw installed	Glazed fraction per window
		°	°		m	m		Tri: COMME LISTE	Tri: COMME LISTE	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
1	F1	23	90	North	0,950	2,090	12-N4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	1	1	1	0,040	2,0	1,21	2,62	61%
2	F2	113	90	East	0,800	2,050	13-E1	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	3,3	1,84	2,53	56%
2	F3	113	90	East	0,800	2,050	13-E1	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	3,3	1,84	2,53	56%
1	F4	113	90	East	0,600	1,275	13-E1	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	0,8	0,32	2,41	42%
1	F5	113	90	East	0,600	1,275	13-E1	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	1	1	1	0,040	0,8	0,32	2,41	42%
2	F6	113	90	East	0,800	2,050	13-E1	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	3,3	1,84	2,53	56%
1	F7	293	90	West	0,800	0,730	17-O4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	0,6	0,23	2,41	40%
1	F8	293	90	West	1,600	0,730	17-O4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	1	1	1	0,040	1,2	0,59	2,52	51%
1	F9	293	90	West	2,400	0,730	10-O2	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	1	1	1	0,040	1,8	0,95	2,57	54%
1	F10	23	90	North	2,070	1,240	20-N5	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	1	1	1	0,040	2,6	1,72	2,66	67%
1	F11	293	90	West	0,807	2,210	21-O5	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	1,8	1,02	2,54	57%
1	F12	293	90	West	0,776	2,210	21-O5	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	0	1	1	0,040	1,7	0,96	2,48	56%
1	F13	293	90	West	0,807	2,210	21-O5	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	1	1	1	0,040	1,8	1,02	2,54	57%
1	F14	23	90	North	0,810	0,855	20-N5	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	1	1	1	0,040	0,7	0,30	2,49	44%
1	F15	113	90	East	0,800	1,275	23-E2	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	1,0	0,52	2,49	51%
1	F16	113	90	East	0,800	1,275	23-E2	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	1	1	1	0,040	1,0	0,52	2,49	51%
1	F17	113	90	East	0,800	1,275	23-E2	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	1,0	0,52	2,49	51%
1	F18	113	90	East	0,800	1,275	23-E2	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	1	1	1	0,040	1,0	0,52	2,49	51%
1	F19	113	90	East	0,600	1,275	23-E2	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	0,8	0,32	2,41	42%
1	F20	113	90	East	0,600	1,275	23-E2	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	1	1	1	0,040	0,8	0,32	2,41	42%
1	F21	203	90	South	1,800	1,070	24-S3	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	1	1	1	0,040	1,9	1,20	2,63	62%
1	F22	203	90	South	0,800	2,190	24-S3	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	1	1	1	0,040	1,8	0,99	2,58	57%
1	F23	203	90	South	1,043	2,190	25-S4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	2,3	1,46	2,60	64%
1	F24	203	90	South	1,067	2,190	25-S4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	0	1	1	0,040	2,3	1,50	2,57	64%
1	F25	203	90	South	1,090	2,190	25-S4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	0	1	1	0,040	2,4	1,55	2,57	65%
1	F26	203	90	South	1,090	2,190	25-S4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	0	1	1	0,040	2,4	1,55	2,57	65%

Heating degree hours [kKh/a: 65,4

					Window rough openings		Installed in	Glazing	Frame	g-Value	U-Value		Ψ Glazing edge	Installation situation user determined value for $\Psi_{installation}$ or '1': $\Psi_{installation}$ from 'Components' worksheet '0': in the case of abutting windows					Results			
Quan-tity	Description	Deviation from north	Angle of inclination from the horizontal	Orien- tation	Width	Height	Selection from 'Areas' worksheet	Selection from 'Components' worksheet	Selection from 'Components' worksheet	Perpen-dicular radiation	Glazing	Frames (avg.)	$\Psi_{Glazing\ edge}$ (Avg.)	left	right	bottom	top	$\Psi_{Installation}$ (Avg.)	Window Area	Glazing area	U_w installed	Glazed fraction per window
		°	°		m	m		Tri: COMME LISTE	Tri: COMME LISTE	-	W/(m²K)	W/(m²K)	W/(mK)	W/(mK) or 1/0				W/(mK)	m²	m²	W/(m²K)	%
0	F27	203	90	South	1,067	2,190	25-S4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040				
0	F28	203	90	South	1,043	2,190	25-S4	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	0	1	1	0,040				
1	F29	293	90	West	0,796	1,275	26-O6	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	0	1	1	0,040	1,0	0,51	2,49	51%
1	F30	293	90	West	0,787	1,275	26-O6	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	0	1	1	0,040	1,0	0,50	2,44	50%
1	F31	293	90	West	0,817	1,275	26-O6	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	0	1	1	1	0,040	1,0	0,53	2,50	51%
1	Porte garage	23	90	North	2,500	2,000	11-N3	06ud-porte garage	06ud-Porte garage	0,00	1,30	1,30	0,000	1	1	1	1	0,200	5,0	4,14	1,66	83%
1	Porte d'entrée	293	90	West	0,970	2,200	10-O2	93ud-Double vitrage isolant 4/12mmair/4	54ud-Existant: bois 68 mm	0,77	2,90	1,60	0,040	1	1	1	1	0,040	2,1	1,32	2,62	62%

Calculation of shading coefficients

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Latitude: 45,77 °

Orientation	Glazing area [m²]	Reduction factor winter r_v	Reduction factor cooling $r_{v,1}$	Reduction factor cooling load $r_{v,2}$	Solar load [kWh/(m²$_{glazing}$a)]
North	7,38	31%	14%	14%	22
East	8,87	52%	24%	21%	76
South	8,25	54%	27%	26%	85
West	7,65	70%	31%	30%	77
Horizontal	0,00	100%	100%	100%	0

								Horizon		Lateral reveal		Reveal / Overhang						Reduction factors for shading in winter				Reduction factors for shading in summer				
Quan-tity	Description	Deviation from North	Angle of inclination from the horizontal	Orientation	Glazing width	Glazing height	Glazing area	Height of the shading object	Horizontal distance	Window reveal depth	Distance from glazing edge to reveal	Overhang depth	Distance from upper glazing edge to overhang	Additional reduction factor winter shading	Additional reduction factor summer shading	Reduction factor z for temporary sun protection	Regulated / transparent	Horizon	Reveal	Overhang	Total for heating case	Horizon	Reveal	Overhang	Total for cooling case	Total for cooling load
		[Degree]	[Degree]		w_G [m]	h_G [m]	A_G [m²]	h_{Hori} [m]	d_{Hori} [m]	o_{Reveal} [m]	d_{Reveal} [m]	o_{over} [m]	d_{over} [m]	$r_{other,w}$ [%]	$r_{other,s}$ [%]	z [%]		r_H [%]	r_R [%]	r_O [%]	r_S [%]	r_H [%]	r_R [%]	r_O [%]	$r_{S,1}$ [%]	$r_{S,2}$ [%]
1	F1	23	90	North	0,67	1,81	1,2	20,00	10,00	0,28	0,067	0,28	0,03		37%			39%	81%	92%	29%	47%	84%	97%	14%	14%
2	F2	113	90	East	0,52	1,77	1,8			0,28	0,434	0,28	0,03	68%	37%	60%			86%	92%	53%		93%	95%	24%	21%
2	F3	113	90	East	0,52	1,77	1,8			0,28	0,434	0,28	0,03	68%	37%	60%			86%	92%	53%		93%	95%	24%	21%
1	F4	113	90	East	0,32	1,00	0,3			0,28	0,334	0,28	0,03	68%	37%	60%			81%	87%	47%		91%	88%	21%	19%
1	F5	113	90	East	0,32	1,00	0,3			0,28	0,334	0,28	0,03	68%	37%	60%			81%	87%	47%		91%	88%	21%	19%
2	F6	113	90	East	0,52	1,77	1,8			0,28	0,434	0,28	0,03	68%	37%	60%			86%	92%	53%		93%	95%	24%	21%
1	F7	293	90	West	0,52	0,45	0,2			0,28	0,434	0,28	0,03	87%	37%	89%			85%	74%	55%		94%	72%	23%	23%
1	F8	293	90	West	1,32	0,45	0,6			0,28	0,834	0,28	0,03	87%	37%	89%			93%	74%	60%		97%	72%	24%	23%
1	F9	293	90	West	2,12	0,45	1,0			0,28	0,067	0,28	0,03	87%	37%	89%			91%	74%	58%		96%	72%	24%	23%
1	F10	23	90	North	1,79	0,96	1,7	17,00	10,00	0,23	0,067	0,28	0,03		37%			42%	93%	86%	33%	48%	94%	91%	15%	15%
1	F11	293	90	West	0,53	1,93	1,0			0,23	0,825	0,28	0,03	95%	37%	97%			92%	92%	81%		97%	97%	34%	34%
1	F12	293	90	West	0,50	1,93	1,0			0,23	0,874	0,28	0,03	95%	37%	97%			92%	92%	81%		97%	97%	34%	34%
1	F13	293	90	West	0,53	1,93	1,0			0,23	0,825	0,28	0,03	95%	37%	97%			92%	92%	81%		97%	97%	34%	34%
1	F14	23	90	North	0,53	0,58	0,3	17,00	10,00	0,23	0,067	0,28	0,03		37%			42%	81%	79%	27%	48%	84%	81%	12%	12%
1	F15	113	90	East	0,52	1,00	0,5	17,00	10,00	0,23	0,434	0,28	0,03	76%	37%	82%		28%	88%	87%	16%	42%	95%	88%	11%	11%
1	F16	113	90	East	0,52	1,00	0,5			0,23	0,434	0,28	0,03	76%	37%	82%			88%	87%	58%		95%	88%	27%	26%
1	F17	113	90	East	0,52	1,00	0,5			0,23	0,434	0,28	0,03	76%	37%	82%			88%	87%	58%		95%	88%	27%	26%
1	F18	113	90	East	0,52	1,00	0,5			0,23	0,434	0,28	0,03	76%	37%	82%			88%	87%	58%		95%	88%	27%	26%
1	F19	113	90	East	0,32	1,00	0,3			0,23	0,334	0,28	0,03	76%	37%	82%			84%	87%	55%		92%	88%	26%	25%
1	F20	113	90	East	0,32	1,00	0,3			0,23	0,334	0,28	0,03	76%	37%	82%			84%	87%	55%		92%	88%	26%	25%
1	F21	203	90	South	1,52	0,79	1,2			1,66	0,884	0,28	0,03	66%	37%	89%			77%	88%	45%		76%	69%	18%	17%
1	F22	203	90	South	0,52	1,91	1,0			1,66	0,268	0,28	0,03	66%	37%	89%			48%	95%	30%		49%	92%	15%	15%
1	F23	203	90	South	0,76	1,91	1,5			0,13	0,034	0,28	0,03	66%	37%	89%			92%	95%	58%		92%	92%	29%	28%
1	F24	203	90	South	0,79	1,91	1,5			0,03	0,000	0,28	0,03	66%	37%	89%			98%	95%	61%		98%	92%	31%	30%
1	F25	203	90	South	0,81	1,91	1,5			0,03	0,000	0,28	0,03	66%	37%	89%			98%	95%	61%		98%	92%	31%	30%
1	F26	203	90	South	0,81	1,91	1,5			0,03	0,000	0,28	0,03	66%	37%	89%			98%	95%	61%		98%	92%	31%	30%
0	F27	203	90	South	0,79	1,91				0,03	0,000	0,28	0,03	66%	37%	89%										
0	F28	203	90	South	0,76	1,91				0,13	0,034	0,28	0,03	66%	37%	89%										
1	F29	293	90	West	0,52	1,00	0,5			0,13	0,034	0,28	0,03	95%	37%	97%			84%	86%	69%		93%	90%	30%	30%
1	F30	293	90	West	0,51	1,00	0,5			0,03	0,000	0,28	0,03	95%	37%	97%			95%	86%	78%		98%	90%	32%	32%
1	F31	293	90	West	0,54	1,00	0,5			0,13	0,034	0,28	0,03	95%	37%	97%			84%	86%	69%		93%	90%	30%	30%
1	Porte garage	23	90	North	2,30	1,80	4,1														75%				100%	100%
1	Porte d'entrée	293	90	West	0,69	1,92	1,3			0,28	0,067	0,28	0,03	87%	37%				77%	92%	62%		90%	97%	32%	32%

Ventilation data

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Treated floor area A_{TFA}	m²	320		*('Areas' worksheet)*
Room height h	m	2,48	2,48	
Volume of ventilated space (A_{TFA}*h) : V_V	m³	793		*(Worksheet 'Annual heating')*

Ventilation type

Please select: **2-Extract air unit**

Infiltration air change rate

Wind protection coefficients e and f		
Coefficient e for wind protection class	Several side exposed	One side exposed
No protection	0,10	0,03
Moderate protection	0,07	0,02
High protection	0,04	0,01
Coefficient f	15	20

			For annual demand:	For heating load:				
Wind protection coefficient, e			0,04	0,10				
Wind protection coefficient, f			15	15	Net air volume for press. test	V_{n50}	Air permeability	q_{50}
Air change rate at press. test	n_{50}	1/h	5,00	5,00	781	m³	4,64	m³/(hm²)

			For annual demand:	For heating load:
Excess extract air		1/h	0,21	0,21
Infiltration air change rate	$n_{V,Rest}$	1/h	0,117	0,387

Selection of ventilation input - Results

PHPP offers two methods for dimensioning air quantities and choosing the ventilation unit. With "Standard data input for balanced ventilation", supply or extract air quantities for residential buildings and parameters for ventilation systems with a maximum of 1 ventilation unit can be planned. Projects with up to 10 different ventilation units and air quantities determined according to rooms or zones can be entered in the 'Addl vent' worksheet. Please select your design method here:

	Ventilation unit / Heat recovery efficiency design		Average air flow rate m³/h	Average air change rate 1/h	Extract air excess (extract air system) 1/h	Effective heat recovery efficiency unit [-]	Energy recovery [-]	Specific power input Wh/m³	Heat recovery efficiency SHX [-]
	Standard design	*('Ventilation' worksheet, see below)*							
x	Multiple ventilation units, non-res	*('Addl vent' worksheet)*	169	0,21	0,21			0,40	0,0%

Cooling degree		Efficiency SHX
	η^*_{SHX}	0%

Average interior humidity during winter operation

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
41%	42%	46%	50%	65%	72%	-	-	70%	63%	48%	42%

Standard data input for balanced ventilation (worksheet inactive. Calculation in 'Addl vent' worksheet)

Dimensioning of ventilation system with only one ventilation unit

Occupancy	m²/P	99				
Number of occupants	P	3,2				
Supply air per person	m³/(P*h)	30				
Supply air requirement	m³/h	97		Bathroom		
Extract air rooms		Kitchen	Bathroom	(shower only)	WC	
Quantity						
Extract air requirement per room	m³/h	60	40	20	20	
Total extract air requirement	m³/h	0				

Design air flow rate (maximum) m³/h — Recommended: 309 m³/h

Average air change rate calculation

Type of operation	Daily operation times h/d	Factors referenced to maximum	Air flow rate m³/h	Air change rate 1/h
maximum		1,00	#WERT!	#WERT!
Standard	**6,9**	**1,00**	#WERT!	#WERT!
Basic	**17,1**	**0,70**	#WERT!	#WERT!
Minimum		**0,40**	#WERT!	#WERT!
	Average value	0,79	Average air flow rate (m³/h)	Average air change rate (1/h)

Selection of ventilation unit with heat recovery

Location of ventilation unit

	Heat recovery efficiency Unit η_{WRG}	Energy recovery η_{ERV}	Specific efficiency [Wh/m³]	Application [m³/h]	Frost power input
Go to ventilation units list Tri: COMME LISTE					
Ventilation unit selection					

Y	W/(mK)	0,000	Implementation of frost protection	2-Elec.
	m	12,15	Limit temperature [°C]	
Y	W/(mK)	0,000	Useful energy [kWh/a]	0
	m	40		
Temperature of mechanical services room	°C		Room temperature (°C)	20
(Enter only if the central unit is outside of the thermal envelope)			Avg. ambient temp. heat. period (°C)	6,8
			Avg. ground temp (°C)	12,5

Effective heat recovery efficiency $\eta_{HR,eff}$

Effective heat recovery efficiency subsoil heat exchanger

SHX efficiency	η^*_{SHX}	
Heat recovery efficiency SHX	η_{SHX}	0%

Secondary calculation
Ψ-value supply or outdoor air duct

Nominal width	160	mm
Insulation thic	100	mm
Reflective coating?	x	Yes
		No
Thermal conductivity	0,035	W/(mK)
Nominal air flow rate		m³/h
Δϑ	13	K
Exterior duct diameter	0,160	m
Exterior diameter	0,360	m
α–Interior		W/(m²K)
α-Surface		W/(m²K)
Ψ–value		**W/(mK)**
Surface temperature difference		K

Secondary calculation
Ψ-value extract or exhaust air duct

Nominal width:	75	mm
Insulation thickness	190	mm
Reflective coating?	x	yes
		no
Thermal conductivity	0,035	W/(mK)
Nominal air flow rate		m³/h
Δϑ	13	K
Exterior duct diameter	0,075	m
Exterior diameter	0,455	m
α–Interior		W/(m²K)
α-Surface		W/(m²K)
Ψ–value		**W/(mK)**
Surface temperature difference		K

Extended input for balanced ventilation

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Planning ventilation systems with multiple ventilation units

Ventilation unit / Heat recovery efficiency design			
In Ventilation sheet (standard design)			*('Ventilation' worksheet)*
In 'Addl vent worksheet (this worksheet)		x	*(Addl vent)*
Treated floor area A_{TFA}	m²	320	*('Areas' worksheet)*
Room height h	m	2,48	*(Worksheet 'Annual heating')*
Room air volume for ventilation (A_{TFA}*h) = V_V	m³	793	*(Worksheet 'Annual heating')*
Number of occupants	P	3,2	*('Ventilation' worksheet)*
Room temperature	°C	20	*(Worksheet 'Annual heating')*
Average external temp. heating period	°C	6,8	*('Ventilation' worksheet)*
Average ground temp.	°C	12,5	*('Ground' worksheet)*
Length of the heating period	d/a	191	*('Heating' worksheet)*
Ventilation type		2-Extract air unit	*('Ventilation' worksheet)*

Results of ventilation design and unit selection:

Venti-lation unit no.	Description of the unit	Design V_{SUP} m³/h	Design V_{ETA} m³/h	Annual average value V_{SUP} m³/h	Annual average value V_{ETA} m³/h	Air ch.rt. 1/h	Effective heat recovery efficiency	Energy recovery efficiency	Spec. input power	Heat recov. efficiency SHX
1	Débit max		215		61	---		N/A	0,42	
2	Débit min		151		108	---		N/A	0,39	
3						---				
4						---				
5						---				
6						---				
7						---				
8						---				
9						---				
10						---				
Result for overall vent. syst.		**0**	**366**	**0**	**169**	**0,21**	No thermal bridges, irrelevant input		**0,40**	**0%**

Recommendations for dimensioning air quantities

Use of low odour and low VOCs building materials/furnishings:
It is strongly recommended to use building materials that cause no or very low VOCs/odours instead of increasing the outdoor air volume in order to clear the air.
This holds true independently from the chosen approach to determine air quality; emissions of all sources in the room should be considered, e.g. furniture, carpets and ventilation or air-conditioning unit.

Assessment of volume flow rates according to the number of persons
Also in non-residential buildings, the number of persons is fundamentally important for assessing the volume air flow rates. For good indoor air quality volumes between 20 to 30 m³/h/person are sufficient.
Higher outdoor air amounts may lead to excessively dry indoor air in winter. The air flow rates are specified by classification according to EN 13779. The classification must be agreed with the client in advance.
IDA 3 is adequate for office buildings. IDA 4 has proven satisfactory for school buildings as flushing ventilation is carried out during breaks anyway. For typical outdoor air CO_2 concentrations of around 400-500 ppm, it is possible to comply even with 1500 ppm. Exceeding this figure temporarily is permissible.

Outdoor air flow rates per person:
- Recommended for residential buildings: around 30 m³/(h person)
- Recommended for offices and similar uses: around 30 m³/(h person) (AMEV: 28 m³/(h person); EN 13779 / IDA 3: at least 24 m³/(h person))
- Recommended for schools and day care centres: 15 to 20 m³/(h person) (Source: Guidelines for energy-efficient educational buildings, Passive House Institute, 2010)
- Recommendation for sport halls: 60 m³/(h person) (DIN 18032-1)

Flushing phase for intermittent ventilation operation
In case the ventilation is to be used intermittently (turned off at night), then it should be flushed in the morning, approx. 1 to 2 hours before building is occupied. This should be done in order to refresh air from emissions such as VOCs. Flushing the building causes that the ventilation system works for a longer period (utilisation time + flushing phase). Please consider this at design stage.

Dimensioning of air quantities - Attention: Planning with an extract air unit

Extract air volume is considered. Select corresponding ventilation type in 'Ventilation' worksheet

When dimensioning the air quantities, please consider the design recommendations given above.
The operation period of the ventilation can be determined on the basis of daily utilisation hours, including flushing phase if applicable. In addition, time periods with reduced ventilation requirements (operation modes) can be taken into account by means of reduction factors.

Room no.	Amount a	Room name	Allocation to ventilation unit (No.)	Area A m²	Clear height h m	Room vol. A x h m³	Volume flow per room V_{SUP} m³/h	V_{ETA} m³/h	V_{TRANS} m³/h	Air chng. rt. per room n 1/h	Utilisation times h/d h	d/week d	Duration of holidays d	Reduction factor 1	Operation red. 1	Reduction factor 2	Operation red. 2	Reduction factor 3	Operation red. 3	Annual average value: V_{SUP} m³/h	V_{ETA} m³/h	V_{TRANS} m³/h	Change rate 1/h
1	1	Maison	1	748	1,00	748	215	215		0,29	24	2	0	100%	100%					61	61		0,08
2	1	Maison	2	748	1,00	748	151	151		0,20	24	5	0	100%	100%					108	108		0,14
3													0	100%	100%								
4													0	100%	100%								
5													0	100%	100%								
6													0	100%	100%								
7													0	100%	100%								
8													0	100%	100%								
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		Additional lines: Please mark complete lines above, copy and paste multiple times																		169	169	---	0,11

Ventilation unit selection - Attention: Planning with an extract air unit

Selection of ventilation type in 'Ventilation' worksheet

Up to 10 different ventilation units are considered. By changing the amount, identical units can be considered. The data from PHI certified ventilation units as well as the entry data lines for user data for other ventilation units can also be found in the worksheet 'Components'. When choosing to use a compact unit the standard design in the 'Ventilation' worksheet has to be used.

Go to ventilation units list

Ventilation unit no.	Quantity [-]	Description of ventilation units	Selection of type of ventilation unit	Design vol. flow per unit m³/h	Application range for volume flow rate from m³/h	to m³/h	Electrical efficiency Wh/m3	Pressure loss calculation ODA-SUP Δp_{Duct} Pa	ETA-EHA Δp_{Duct} Pa	Additional Δp_{intern} Pa	Application range per line $\Delta p_{External}$ Pa	Subtraction Δp_{intern} degree	Interior location (x)	Exterior location (x)	Heat recovery efficiency Unit [-]	Effective [-]	Energy recovery efficiency [-]	Frost protection necessary	Subsoil HX Efficiency of heat recovery	Effective efficiency of heat recovery	Frost protection (electr. / hydr.) Tipe perature	Limit temperature °C	Useful V_{SUP} kWh/a
			Change sorting type												No thermal bridges, irrelevant input								
1	1	Débit max	01ud-Genvex energy S > 183 m3/h	215	74	184	0,42	50	50		-	-	x		0,79	74%	N/A	N/A		0%	2-Elec.	-3	0
2	1	Débit min	02ud Genvex energy S <153 m3/h	151	74	153	0,39	50	50		-	-	x		0,87	82%	N/A	N/A		0%	2-Elec.	-3	0
3																					2-Elec.		0
4																					2-Elec.		0
5																					2-Elec.		0
6																					2-Elec.		0
7																					2-Elec.		0
8																					2-Elec.		0
9																					2-Elec.		0
10																					2-Elec.		0
																					Total (directly electric)		0
																					Total (hydraulic and heat generator)		0

Data entries for duct sections between the ventilation unit and the thermal envelope

The duct sections between the ventilation unit and the thermal envelope should be as short as possible and should be well insulated, whether the ventilation unit is located indoors or outdoors. The dimensions of these duct sections can be entered here. The heat losses of the overlying duct sections will be considered for the effective heat recovery efficiency.
One section of a duct entered here may also be used for multiple ventilation units.
If in the section "Ventilation unit - selection" (above) a ventilation unit is selected as multiple units (amount larger than 1 for identical units), then the corresponding duct sections may simply be entered (duct sections for one ventilation unit).

Temperature of installation location: (only enter when at least one unit is installed outside of the thermal envelope)

Quantity	Round duct ins. diameter mm	Rectangular duct Width mm	Height mm	Insulation thickness mm	Thermal conductivity W/(m K)	Reflective insulation duct (x)	Duct transmittance W/(m K)	Length of supply air duct m	Outdoor or supply air duct (1)	Exhaust or extract air duct (1)	Duct type	Design volume rate	Assignment to ventilation unit (enter 1 for the corresponding ventilation unit) Vent. unit 1	Vent. unit 2	Vent. unit 3	Vent. unit 4	Vent. unit 5	Vent. unit 6	Vent. unit 7	Vent. unit 8	Vent. unit 9	Vent. unit 10
1	160			100	0,035	x	0,239	6,15	1		Outdoor air	366	1	1								
1	160			100	0,035	x	0,239	6		1	Exhaust air	366	1	1								
1	75			190	0,035	x	0,116	40	1		Outdoor air	366	1	1								
												0										
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Specific energy for heating (annual method)

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Interior temperature: 20,0 °C
Building type: Maison unifamiliale individuelle
Treated floor area A_{TFA}: 319,8 m²

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Temp. factor f_t		G_t kKh/a		kWh/a	Per m² of treated floor area
External wall - Ambient	A	299,4	*	0,780	*	1,00	*	65,4	=	15289	47,80
External wall - Ground	B	56,0	*	3,651	*	0,12	*	65,4	=	1623	5,07
Roof/Ceiling - Ambient	A	217,2	*	0,090	*	1,00	*	65,4	=	1278	4,00
Floor slab / Basement ceiling	B	213,6	*	2,098	*	0,12	*	65,4	=	3560	11,13
	A		*		*	1,00	*		=		
	A		*		*	1,00	*		=		
	X		*		*	0,75	*		=		
Windows	A	54,3	*	2,461	*	1,00	*	65,4	=	8739	27,32
Exterior door	A		*		*	1,00	*		=		
Exterior TB (length/m)	A	216,3	*	0,199	*	1,00	*	65,4	=	2823	8,83
Perimeter TB (length/m)	P	63,5	*	0,000	*	0,12	*	65,4	=	0	0,00
Ground TB (length/m)	B	32,8	*	0,056	*	0,12	*	65,4	=	15	0,05
Total of all building envelope areas		840,5								kWh/a	kWh/(m²a)
Transmission heat losses Q_T									Total	33326	104,2

		A_{TFA} m²		Clear room height m	=	m³
Ventilation system:	Effective air volume, V_V	319,8	*	2,48	=	793,2
Effective heat recovery efficiency	η_{eff} 0%					
Efficiency of subsoil heat exchanger						
Heat recovery efficiency of SHX	η_{SHX} 0%					

	$n_{V,system}$ 1/h		η_{HR}		$n_{V,Res}$ 1/h	=	1/h
Energetically effective air changes nV	0,213	* (1 -	0,00	) +	0,117	=	0,330

	V_V m³		n_V 1/h		c_{Air} Wh/(m³K)		G_t kKh/a	=	kWh/a	kWh/(m²a)
Ventilation heat losses Q_V	793,2	*	0,330	*	0,33	*	65,4	=	5653	17,7

	Q_T kWh/a		Q_V kWh/a		Reduction factor night/weekend Saving	=	kWh/a	kWh/(m²a)
Total heat losses Q_L	(33326	+	5653	)	1,0	=	38979	**121,9**

Orientation of the area	Reduction factor See 'Windows' sheet		g-Value (perp. radiation)		Area m²		Radiation HP kWh/(m²a)	=	kWh/a	kWh/(m²a)
North	0,18	*	0,34	*	10,24	*	105	=	66	
East	0,22	*	0,77	*	16,98	*	284	=	811	
South	0,28	*	0,77	*	13,07	*	390	=	1089	
West	0,31	*	0,77	*	13,98	*	167	=	558	
Horizontal	0,00	*	0,00	*	0,00	*	349	=	0	
Available solar heat gains Q_S								Total	2523	7,9

	kh/d		Length heating period d/a		Spec. power q_l W/m²		A_{TFA} m²	=	kWh/a	kWh/(m²a)
Internal heat gains Q_I	0,024	*	191	*	2,26	*	319,8	=	3303	10,3

		kWh/a	kWh/(m²a)
Free heat Q_F	Q_S + Q_I =	5826	18,2
Ratio of free heat to losses	Q_F / Q_V =	0,15	
Utilisation factor heat gains h_G	$(1 - (Q_F / Q_L)^5) / (1 - (Q_F / Q_L)^6)$ =	100%	
Heat gains Q_G	η_G * Q_F =	5826	**18,2**

		kWh/a	kWh/(m²a)
Annual heating demand Q_H	Q_L - Q_G =	33153	**104**

	kWh/(m²a)	(Yes/No)
Limiting value	20	**Requirement met?** **No**

Specific energy for heating (monthly method)

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

The sum of the heating periods calculated through the monthly method will be presented on this side.

Interior temperature:	20	°C
Building type:	Maison unifamiliale individuell	
Treated floor area A_{TFA}:	319,8	m²
Spec. Capacity:	132	Wh/(m²K)

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Month. red. fac.		G_t kKh/a		kWh/a	Per m² of treated floor area
External wall - Ambient	A	299,4	*	0,780	*	1,00	*	79	=	18373	57,44
External wall - Ground	B	56,0	*	3,651	*	1,00	*	10	=	2104	6,58
Roof/Ceiling - Ambient	A	217,2	*	0,090	*	1,00	*	79	=	1536	4,80
Floor slab / Basement ceiling	B	213,6	*	2,098	*	1,00	*	10	=	4614	14,42
	A		*		*	1,00	*		=		
	A		*		*	1,00	*		=		
	X		*		*	0,75	*		=		
Windows	A	54,3	*	2,461	*	1,00	*	79	=	10502	32,83
Exterior door	A		*		*	1,00	*		=		
Exterior TB (length/m)	A	216,3	*	0,199	*	1,00	*	79	=	3392	10,61
Perimeter TB (length/m)	P	63,5	*	0,000	*	1,00	*	10	=	0	0,00
Ground TB (length/m)	B	32,8	*	0,056	*	1,00	*	10	=	19	0,06
											kWh/(m²a)
Transmission heat losses Q_T									Total	40539	126,7

	A_{TFA} m²		Clear room height m		m³
Effective air volume V_V	320	*	2,48	=	793

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HR}		$n_{V,Res}$ 1/h		$n_{V,equi,fraction}$ 1/h
Effective air change rate Ambient nV,e	0,213	*(1-	0%	)*(1-	0,00	)+	0,117	=	0,330
Effective air change rate Ground nV,g	0,213	*	0%	*(1-	0,00	)		=	0,000

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)		G_t kKh/a		kWh/a	kWh/(m²a)
Ventilation losses ambient Q_V	793	*	0,330	*	0,33	*	79	=	6793	21,2
Ventilation losses ground $Q_{V,e}$	793	*	0,000	*	0,33	*	55	=	0	0,0
Ventilation heat losses Q_V								Total	6793	21,2

	Q_T kWh/a		Q_V kWh/a		Reduction factor night/weekend saving		kWh/a	kWh/(m²a)
Total heat losses Q_L	(40539	+	6793	) *	1,0	=	47332	**148,0**

Orientation of the area	Reduction factor see 'Windows' worksheet		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0,18	*	0,34	*	10,2	*	257	=	160
East	0,22	*	0,77	*	17,0	*	614	=	1750
South	0,28	*	0,77	*	13,1	*	748	=	2091
West	0,31	*	0,77	*	14,0	*	418	=	1401
Horizontal	0,00	*	0,00	*	0,0	*	860	=	0
Sum opaque areas									3938
									kWh/(m²a)
Available solar heat gains Q_S								Total	9341	29,2

	kh/d		Length Heat. Period d/a		Spec. Power q_I W/m²		A_{TFA} m²		kWh/a	kWh/(m²a)
Internal heat gains Q_I	0,024	*	303	*	2,3	*	319,8	=	5248	16,4

			kWh/a	kWh/(m²a)
Free heat Q_F	Q_S + Q_I	=	14589	45,6
Ratio free heat to losses	Q_F / Q_L	=	0,31	
Utilisation factor heat gains h_G		=	91%	
Heat gains Q_G	η_G * Q_F	=	13283	**41,5**

			kWh/a	kWh/(m²a)
Annual heating demand Q_H	Q_L - Q_G	=	34049	**106**

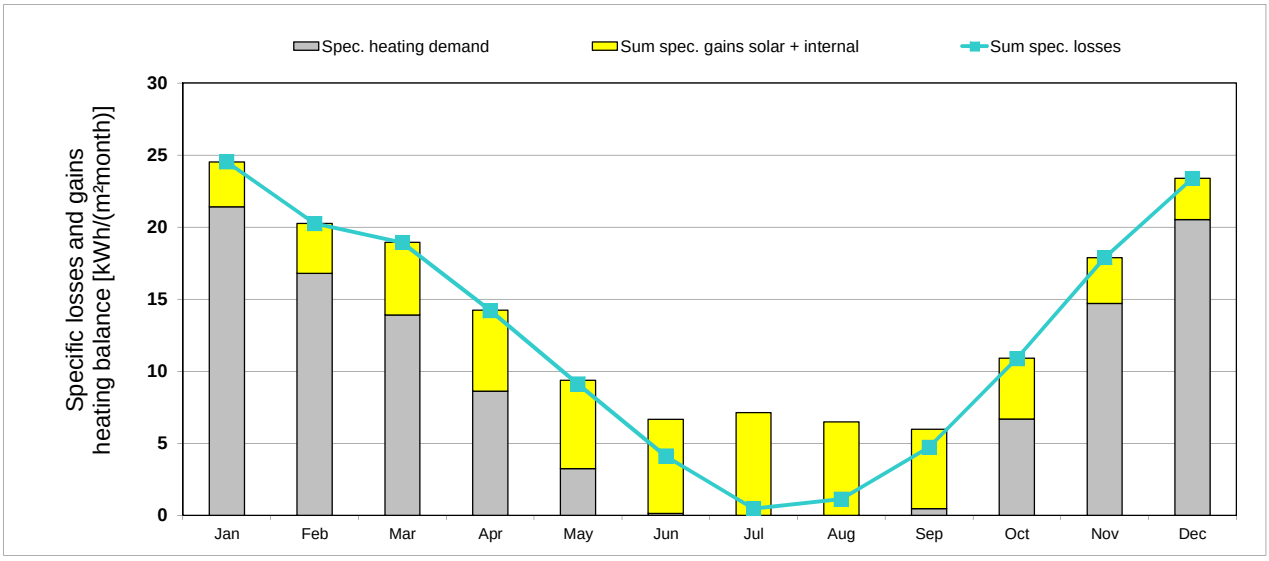
	kWh/(m²a)		(Yes/No)
Limiting value	20	**Requirement met?**	**No**

Specific energy for heating (monthly method)

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Interior temperature: 20 °C
Building type: Maison unifamiliale individuelle
Treated floor area A_{TFA}: 320 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - External	13,3	10,7	9,9	7,3	4,5	1,8	-0,2	0,3	2,4	5,9	9,9	12,9	79	kKh
Heating degree hours - Ground	1,5	1,4	1,5	1,2	0,9	0,6	0,4	0,3	0,4	0,6	0,9	1,3	11	kKh
Losses - Exterior	6865	5547	5091	3763	2319	935	-95	162	1259	3062	5111	6644	40663	kWh
Losses - Ground	980	928	964	780	596	378	244	196	251	418	607	833	7176	kWh
Sum spec. losses	24,5	20,2	18,9	14,2	9,1	4,1	0,5	1,1	4,7	10,9	17,9	23,4	149,6	kWh/m²
Solar gains - North	6	10	16	21	29	35	36	26	18	12	8	5	223	kWh
Solar gains - East	89	122	204	233	255	283	328	285	238	152	97	77	2363	kWh
Solar gains - South	141	169	261	255	240	253	281	295	291	215	144	121	2667	kWh
Solar gains - West	47	73	151	217	258	283	310	260	177	107	54	34	1970	kWh
Solar gains - Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar gains - Opaque	174	246	439	551	640	714	787	672	513	326	192	142	5397	kWh
Internal heat gains	537	485	537	520	537	520	537	537	520	537	520	537	6322	kWh
Sum spec. gains solar + internal	3,1	3,5	5,0	5,6	6,1	6,5	7,1	6,5	5,5	4,2	3,2	2,9	59,2	kWh/m²
Utilisation factor	100%	100%	100%	100%	96%	61%	7%	17%	77%	100%	100%	100%	73%	
Annual heating demand	6850	5371	4448	2754	1035	41	0	0	149	2135	4704	6561	34049	kWh
Spec. heating demand	**21,4**	**16,8**	**13,9**	**8,6**	**3,2**	**0,1**	**0,0**	**0,0**	**0,5**	**6,7**	**14,7**	**20,5**	**106,5**	kWh/m²



Annual heating demand: Comparison

Monthly method	*('Heating')*	**34049**	**kWh/a**	**106,5**	**kWh/(m²a)** reference to treated floor area according to PHPP
Annual method	*('Annual heating')*	**33153**	**kWh/a**	**103,7**	**kWh/(m²a)** reference to treated floor area according to PHPP

Heating load

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Interior temperature: 20 °C
Building type: Maison unifamiliale individuelle
Treated floor area A_{TFA}: 319,8 m²

	Design temperature		Radiation:	North	East	South	West	Horizontal	
Weather 1:	-4,1	°C		25	40	85	40	65	W/m²
Weather 2:	-2,5	°C		10	10	10	10	10	W/m²
Ground design temp.	17,9	°C							

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Factor always 1 (except "X")		TempDiff 1 K		TempDiff 2 K		PT 1 W		PT 2 W
External wall - Ambient	A	299,4	*	0,780	*	1,00	*	24,1	or	22,5	=	5636	or	5264
External wall - Ground	B	56,0	*	3,651	*	1,00	*	2,1	or	2,1	=	431	or	431
Roof/Ceiling - Ambient	A	217,2	*	0,090	*	1,00	*	24,1	or	22,5	=	471	or	440
Floor slab / Basement ceiling	B	213,6	*	2,098	*	1,00	*	2,1	or	2,1	=	946	or	946
	A		*		*	1,00	*	24,1	or	22,5	=		or	
	A		*		*	1,00	*	24,1	or	22,5	=		or	
	X		*		*	0,75	*	24,1	or	22,5	=		or	
Windows	A	54,3	*	2,461	*	1,00	*	24,1	or	22,5	=	3222	or	3009
Exterior door	A		*		*	1,00	*	24,1	or	22,5	=		or	
Exterior TB (length/m)	A	216,3	*	0,199	*	1,00	*	24,1	or	22,5	=	1041	or	972
Perimeter TB (length/m)	P	63,5	*	0,000	*	1,00	*	2,1	or	2,1	=	0	or	0
Ground TB (length/m)	B	32,8	*	0,056	*	1,00	*	2,1	or	2,1	=	4	or	4
Building element towards neighbour	I		*		*	1,00	*	3,0	or	3,0	=		or	

Transmission heat load P_T

Total = 11751 or 11066

Ventilation system:

Effective air volume, V_V: A_{TFA} 319,8 m² * Clear room height 2,48 m = 793 m³

Heat recovery efficiency of the heat exchanger η_{HR} 0%
Heat recovery efficiency SHX 0%
Heat recovery efficiency SHX $\eta_{SHX\ 1}$ 0% or $\eta_{SHX\ 2}$ 0%

Energetically effective air changes n_V: $n_{V,Res}$ (Heating Load) 0,387 1/h + $n_{V,system}$ 0,213 1/h *(1- Φ_{HP} 0,00 or 0,00) = 0,600 1/h or 0,600 1/h

Ventilation heat load P_V

V_V m³		n_V 1/h		n_V 1/h		c_{Air} Wh/(m³K)		TempDiff 1 K		TempDiff 2 K		P_V 1 W		P_V 2 W
793,2	*	0,600	or	0,600	*	0,33	*	24,1	or	22,5	=	3787	or	3536

Total heating load P_L

	PL 1 W		PL 2 W
$P_T + P_V$ =	15538	or	14602

Orientation of the area	Area m²		g-Value (perp. radiation)		Reduction factor (see 'Windows' worksheet)		Radiation 1 W/m²		Radiation 2 W/m²		P_T 1 W		P_T 2 W
North	10,2	*	0,3	*	0,18	*	25	or	10	=	16	or	6
East	17,0	*	0,8	*	0,22	*	54	or	10	=	154	or	29
South	13,1	*	0,8	*	0,28	*	80	or	10	=	224	or	28
West	14,0	*	0,8	*	0,31	*	31	or	10	=	102	or	34
Horizontal	0,0	*	0,0	*	0,40	*	65	or	10	=	0	or	0

Solar heating power P_S: Total = 497 or 96

Internal heating load P_I: Spec. power 1,8 W/m² * A_{TFA} 320 m² = P_I 1: 562 W or P_I 2: 562 W

Heating power (gains) P_G

	P_G 1 W		P_G 2 W
$P_T + P_I$ =	1058	or	658

$P_L - P_G$ = 14480 or 13944

Heating load P_H = 14480 W

Area specific space heating load P_H / A_{TFA} = 45,3 W/m²

Input max. supply air temperature 52 °C
Max. supply air temperature $\vartheta_{Supply,Max}$ 52 °C

Supply air temperature without heating $\vartheta_{Supply,Min}$: 1 °C -4,1 °C or 2 °C -2,5 °C

For comparison: heating load transportable by the supply Air $P_{Supply\ Air,Max}$ = 3128 W specific: 9,8 W/m²

Supply air heating: Sufficient? (Yes/No) No

Summer ventilation

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Building volume:	793	m³	Building type:	Maison unifamiliale individuelle
Max. indoor absolute humidity:	12	g/kg	Heat recovery η_{HRV}:	0%
Internal humidity sources:	198,6740887	g/(P*h)	Energy recovery η_{ER}:	0%
			Subsoil heat exchanger η^*_{SHX}:	0%

Results passive cooling			Results active cooling		
Frequency of overheating:	0,0%	at the overheating limit ϑ_{max} = 25 °C	Useful cooling demand:	0,1	kWh/(m²a)
max. humidity:	14,1	g/kg	Dehumidification demand:	0,0	kWh/(m²a)
Frequency of exceeded humidity:	6,1%		Frequency of exceeded humidity:	6,1%	

Summer basic ventilation to ensure adequate air quality

Air change rate via vent. system with supply air:	0,21	1/h	HRV/ERV in summer (check only one field)	
			None	
			Automatic bypass, controlled by temperature difference	x
			Automatic bypass, controlled by enthalpy difference	
			Always	
Air change rate via extract air system:		1/h		
			Specific power consumption (for extract air system)	0,20 Wh/m³
Window ventilation air change rate:	0,00	1/h		

Effective air change rate

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HP}		$n_{V,equi,fraction}$ 1/h
Exterior $n_{V,e}$	0,213	*(1-	0%	)*(1-	0,00	) =	0,213
without HR	0,213	*(1-	0%	)		=	0,213
Ground $n_{L,g}$	0,213	*	0%	*(1-	0,00	) =	0,000
without HR	0,213	*	0%			=	0,000

Ventilation conductance

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)			
exterior $H_{V,e}$	793	*	0,213	*	0,33	=	55,7	W/K
without HR	793	*	0,213	*	0,33	=	55,7	W/K
ground $H_{V,g}$	793	*	0,000	*	0,33	=	0,0	W/K
without HR	793	*	0,000	*	0,33	=	0,0	W/K
Infiltration, window, extract air system	793	*	0,117	*	0,33	=	30,7	W/K

Additional summer ventilation for cooling

Additional ventilation regulation

Minimum acceptable indoor temp. 22,0 °C

Type of additional ventilation

Window night ventilation, manual	Night ventilation value	0,00	1/h	
Mechanical, automatically Controlled ventilation	Corresponding air change rate during operation, in addition to basic air change		1/h	Controlled by (please check)
	Specific power consumption		Wh/m³	Temperature diff.
				Humidity diff. x

Secondary calculation: Hygienic air change rate through window ventilation

Estimation for window air change rate to ensure sufficient air quality

Description								
	Open duration [h/d]							
Climate boundary conditions								
	Temperature diff interior - exterior							K
	Wind velocity							m/s
Window group 1								
	Quantity							
	Clear width							m
	Clear height							m
	Tilting window (check if appropriate)							
h	Opening width (for tilting windows)							m
Window group 2 (cross ventilation)								
	Quantity							
	Clear width							m
	Clear height							m
	Tilting window (check if appropriate)							
	Opening width (for tilting windows)							m
	Difference in height to window 1							m
							Total	
Result: Air change rate		**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**1/h**

Secondary calculation: Additional night ventilation for cooling

Air change value during additional window night ventilation

Description								
	Reduction factor							
Climate boundary conditions								
	Temperature diff interior - exterior	1	1	1	1	1	1	K
	Wind velocity	0	0	0	0	0	0	m/s
Window group 1								
	Quantity							
	Clear width							m
	Clear height							m
	Tilting window (check if appropriate)							
	Opening width (for tilting windows)							m
Window group 2 (cross ventilation)								
	Quantity							
	Clear width							m
	Clear height							m
	Tilting window (check if appropriate)							
	Opening width (for tilting windows)							m
	Difference in height to window 1							m
							Total	
Result: Night ventilation values		**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**1/h**

Summer: Passive cooling

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Building type:	Maison unifamiliale individuelle		Treated floor area A_{TFA}:	319,8	m²
Upper temperature limit:	25	°C	Building volume:	793	m³
Nominal humidity:	12	g/kg	Internal humidity sources:	2,0	g/(m²h)
Spec. capacity:	132	Wh/(m²K)			

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Red. factor $f_{T,Summer}$		H_{Summer} heat conductance
External wall - Ambient	A	299,4	*	0,780	*	1,00	=	233,7
External wall - Ground	B	56,0	*	3,651	*	1,00	=	204,3
Roof/Ceiling - Ambient	A	217,2	*	0,090	*	1,00	=	19,5
Floor slab / Basement ceiling	B	213,6	*	2,098	*	1,00	=	448,0
	A		*		*	1,00	=	
	A		*		*	1,00	=	
	X		*		*	0,75	=	
Windows	A	54,3	*	2,461	*	1,00	=	133,6
Exterior door	A		*		*	1,00	=	
Exterior TB (length/m)	A	216,3	*	0,199	*	1,00	=	43,1
Perimeter TB (length/m)	P	63,5	*	0,000	*	1,00	=	0,0
Ground TB (length/m)	B	32,8	*	0,056	*	1,00	=	1,8

Exterior thermal transmittance, $H_{T,e}$	430,0	W/K
Ground thermal transmittance, $H_{T,g}$	654,1	W/K

Summer ventilation

from 'SummVent' worksheet

Ventilation unit conductance			Ventilation parameter			Summer ventilation regulation	
exterior $H_{V,e}$	55,7	W/K	Temperature amplitude summer	10,4	K		HRV/ERV
without HR	55,7	W/K	Minimum acceptable indoor temperature	22,0	°C	None	
ground $H_{V,g}$	0,0	W/K	Heat capacity air	0,33	Wh/(m³K)	Controlled by temperature	x
without HR	0,0	W/K	Supply air changes	0,21	1/h	Controlled by enthalpy	
Ventilation conductance, others			Outdoor air changes	0,12	1/h	Always	
exterior	30,7	W/K	Window night ventilation air change rate, manual @ 1K	0,00	1/h		Additional ventilation
			Air change rate due to mech. automatically controlled vent.	0,00	1/h	Controlled by temperature	
			Specific power consumption for	0,00	Wh/m³	Controlled by humidity	x
			η_{HR}	0%			
			η_{ERV}	0%			
			η^*_{SHX}	0%			

Orientation of the area	Angle factor Summer		Shading factor Summer		Shading dirt		g-Value (perp. radiation)		Area m²		Portion of glazing		**Aperture** m²
North	0,9	*	0,14	*	0,95	*	0,34	*	10,2	*	72%	=	0,3
East	0,9	*	0,21	*	0,95	*	0,77	*	17,0	*	52%	=	1,3
South	0,9	*	0,26	*	0,95	*	0,77	*	13,1	*	63%	=	1,4
West	0,9	*	0,30	*	0,95	*	0,77	*	14,0	*	55%	=	1,5
Horizontal	0,9	*	1,00	*	0,95	*	0,00	*	0,0	*	0%	=	0,0
Sum opaque areas													7,9

Solar aperture	Total	12,4	m²/m² 0,04

	Specif. power q_I W/m²		A_{TFA} m²		W	W/m²
Internal heat gains Q_I	2,3	*	320	=	722	2,3

Frequency of overheating $h_{\vartheta \geq Jmax}$ 0,0%

At the overheating limit ϑ_{max} = 25 °C

If the "frequency over 25°C" exceeds 10%, additional measures to protect against the heat during the summer are necessary.

Daily internal temperature stroke

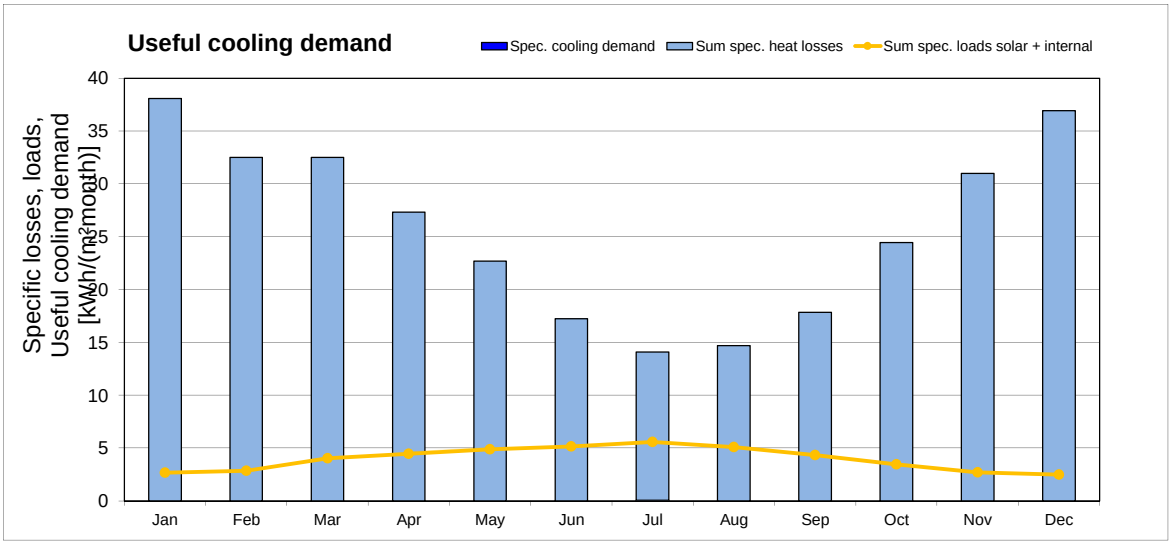
	Transmission kWh/d		Ventilation kWh/d		Solar load kWh/d		1/k		Spec. capacity Wh/(m²K)		A_{TFA}: m²			
(	53,7	+	10,8	+	49,9	) *	1000	/ (	132	*	320	) =	**2,7**	K

Cooling: energy value for useful cooling energy

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Interior Temperature: 25 °C
Building type: Maison unifamiliale individuelle
Treated Floor Area A_{TFA}: 320 m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating degree hours - Exterior	17,1	14,1	13,6	10,9	8,2	5,4	3,6	4,1	6,1	9,7	13,5	16,6	123	kKh
Heating degree hours - Ground	5,2	4,8	5,2	4,8	4,6	4,2	4,1	4,0	4,0	4,4	4,5	5,0	55	kKh
Losses - Exterior	8771	7269	6997	5608	4224	2780	1811	2068	3103	4968	6956	8550	63104	kWh
Losses - Ground	3413	3126	3397	3135	3030	2733	2677	2629	2606	2851	2962	3267	35827	kWh
Losses summer ventilation	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Sum spec. heat losses	38,1	32,5	32,5	27,3	22,7	17,2	14,0	14,7	17,9	24,4	31,0	36,9	309,3	kWh/m²
Solar load North	3	5	8	10	14	17	18	13	9	6	4	3	110	kWh
Solar load East	43	59	98	112	123	137	158	138	115	73	47	37	1140	kWh
Solar load South	73	87	135	132	124	131	146	152	151	111	75	63	1380	kWh
Solar load West	22	34	69	99	119	130	142	119	81	49	25	15	904	kWh
Solar load Horiz.	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh
Solar load Opaque	174	246	439	551	640	714	787	672	513	326	192	142	5397	kWh
Internal heat gains	537	485	537	520	537	520	537	537	520	537	520	537	6322	kWh
Sum spec. loads solar + internal	2,7	2,9	4,0	4,5	4,9	5,2	5,6	5,1	4,3	3,4	2,7	2,5	47,7	kWh/m²
Utilisation factor losses	7%	9%	12%	16%	21%	30%	39%	35%	24%	14%	9%	7%	15%	
Useful cooling energy demand	0	0	0	0	0	2	18	3	0	0	0	0	24	kWh
Spec. cooling demand	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,1**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,1**	kWh/m²
Specif. dehumidification demand	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	**0,0**	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	100%	62%	100%	100%	100%	100%	100%	69%	



Cooling: energy value for useful cooling energy

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

The sum of the cooling periods calculated through the monthly method will be presented on this side.

Building type:	Maison unifamiliale individuelle		Treated floor area A_{TFA}:	319,8	m²
Interior temperature summer:	25	°C	Building volume:	793	m³
Nominal humidity:	12	g/kg	Internal humidity sources:	2,0	g/(m²h)
Spec. capacity:	132	Wh/(m²K)			

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Mon. red. fac.		G_t kKh/a		kWh/a	per m² treated floor area
External wall - Ambient	A	299,4	*	0,780	*	1,00	*	27	=	6402	20,02
External wall - Ground	B	56,0	*	3,651	*	1,00	*	21	=	4271	13,35
Roof/Ceiling - Ambient	A	217,2	*	0,090	*	1,00	*	27	=	535	1,67
Floor slab / Basement ceiling	B	213,6	*	2,098	*	1,00	*	21	=	9366	29,28
	A		*		*	1,00	*		=		
	A		*		*	1,00	*		=		
	X		*		*	0,75	*		=		
Windows	A	54,3	*	2,461	*	1,00	*	27	=	3659	11,44
Exterior door	A		*		*	1,00	*		=		
Exterior TB (length/m)	A	216,3	*	0,199	*	1,00	*	27	=	1182	3,70
Perimeter TB (length/m)	P	63,5	*	0,000	*	1,00	*	27	=	0	0,00
Ground TB (length/m)	B	32,8	*	0,056	*	1,00	*	21	=	38	0,12

Transmission losses Q_T (negative: heat loads) — Total 25454 kWh/a — 79,6 kWh/(m²a)

Summer ventilation

from 'SummVent' worksheet

Ventilation conductance, vent. unit

exterior $H_{V,e}$	55,7	W/K
without HR	55,7	W/K
ground $H_{V,g}$	0,0	W/K
without HR	0,0	W/K

Ventilation conductance, others

exterior	30,7	W/K

Ventilation parameter

Temperature amplitude summer	10,4	K
Minimum acceptable indoor temperature	22,0	°C
Heat capacity air	0,33	Wh/(m³K)
Supply air changes	0,21	1/h
Outdoor air changes	0,12	1/h
Window night vent. air change rate, manual @ 1K	0,00	1/h
Air changes rate due to mech., autom. controlled vent.	0,00	1/h
Specific power consumption for	0,00	Wh/m³
η_{HR}	0%	
η_{ERV}	0%	
η^*_{SHX}	0%	

Summer ventilation regulation

	HRV/ERV in summer
None	
Controlled by temp.	x
Controlled by enthalpy	
Always	
	Additional ventilation
Controlled by temp.	
Controlled by humidity	x

	$n_{V,system}$ 1/h		η^*_{SHX}		η_{HR} (considers bypass)		$n_{V,Rest}$ 1/h		$n_{V,equi,fraction}$ 1/h
Hygienic air change									
Effective air change rate Ambient $n_{V,e}$	0,213	*(1-	0%	)*(1-	0,00	)+	0,117	=	0,330
Effective air change rate Ground $n_{V,g}$	0,213	*	0%	*(1-	0,00	)		=	0,000

	V_V m³		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)		G_t kKh/a		kWh/a	kWh/(m²a)
Ventilation losses ambient Q_V	793	*	0,330	*	0,33	*	26	=	2208	6,9
Ventilation losses ground $Q_{V,e}$	793	*	0,000	*	0,33	*	0	=	0	0,0
Heat losses summer ventilation	793	*	0,000	*	0,33	*	0	=	0	0,0

Ventilation heat losses Q_V — Total 2208 kWh/a — 6,9 kWh/(m²a)

	Q_T kWh/a		Q_V kWh/a		kWh/a	kWh/(m²a)
Total heat losses Q_L	25454	+	2208	=	27661	**86,5**

Orientation of the area	Reduction factor		g-Value (perp. radiation)		Area m²		Global radiation kWh/(m²a)		kWh/a
North	0,09	*	0,34	*	10,2	*	232	=	71
East	0,11	*	0,77	*	17,0	*	487	=	670
South	0,14	*	0,77	*	13,1	*	487	=	704
West	0,14	*	0,77	*	14,0	*	384	=	591
Horizontal	0,40	*	0,00	*	0,0	*	783	=	0
Sum opaque areas									3327

Available solar heat gains Q_S — Total 5363 kWh/a — 16,8 kWh/(m²a)

	kh/d		Length heat. period d/a		Spec. power q_I W/m²		A_{TFA} m²		kWh/a	kWh/(m²a)
Internal heat gains Q_I	0,024	*	153	*	2,3	*	319,8	=	2650	8,3

		kWh/a	kWh/(m²a)
Sum heat loads Q_F	$Q_S + Q_I$ =	8013	**25,1**

Ratio of losses to free heat gains	Q_L / Q_F =	3,45	
Utilisation factor heat losses η_G	=	29%	
Useful heat losses $Q_{V,n}$	$\eta_G * Q_L$ =	7989 kWh/a	**25,0** kWh/(m²a)
Useful cooling demand Q_K	$Q_F - Q_{V,n}$ =	24 kWh/a	**0** kWh/(m²a)

	kWh/(m²a)		(Yes/No)
Recommended maximum value	15	**Requirement met?**	**Yes**

Compressor - cooling units

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Building type:	Maison unifamiliale individuelle		Treated floor area A_{TFA}:	319,8	m²
Interior temperature summer:	25,0	°C	Mechanical cooling:		
Nominal humidity:	12,0	g/kg	Air change rate via ventilation system with supply air:	0,2	
Internal humidity sources:	2,0	g/(m²h)			

Supply air cooling
check as appropriate

On/Off mode (check as appropriate)		
Max. cooling capacity (sensible + latent)		kW
Temperature reduction dry	0,0	K
Seasonal energy efficiency ratio		

Recirculation cooling
check as appropriate

On/Off mode (check as appropriate)		
Max. cooling capacity (sensible + latent)		kW
Volume flow rate at nominal power		m³/h
Temperature reduction dry		K
Variable air volume (check if appropriate)		
Seasonal energy efficiency ratio		

Additional dehumidification
check as appropriate

Waste heat to room (please check if applicable)	
Seasonal energy efficiency ratio	

Panel cooling
check as appropriate

Seasonal energy efficiency ratio	

	Sensible kWh/(m²a)		Latent kWh/(m²a)		COP		Electricity demand (kWh/a) kWh/(m²a)	Sensible fraction
Useful cooling total	0,1		0,0					69%
Cooling contribution by:								
Supply air cooling	(	+		) /	0,0	=		
Recirculation cooling	(	+		) /	0,0	=		
Dehumidification				/		=		0%
Remaining for panel cooling				/	0,0	=		100%
Cooling distribution				/		=		100%
Total	(0,0	+	0,0	) /		=	0,0	0%

			(Yes/No)
Unsatisfied demand		**Cooling demand covered?**	

Compressor - cooling units

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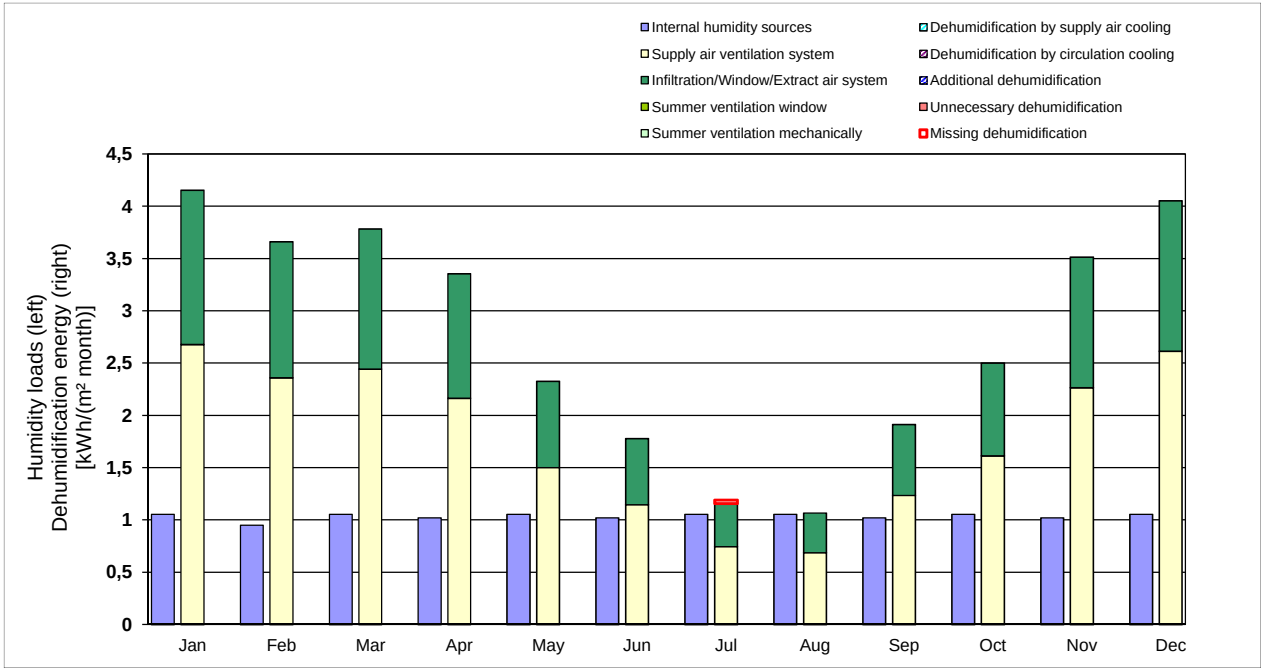
Humidity loads and humidity removal

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Internal humidity sources	1,1	1,0	1,1	1,0	1,1	1,0	1,1	1,1	1,0	1,1	1,0	1,1	12	kWh/m²
Infiltration/Window/Extract air system	-1,5	-1,3	-1,3	-1,2	-0,8	-0,6	-0,4	-0,4	-0,7	-0,9	-1,2	-1,4	-12	kWh/m²
Supply air ventilation system	-2,7	-2,4	-2,4	-2,2	-1,5	-1,1	-0,7	-0,7	-1,2	-1,6	-2,3	-2,6	-21	kWh/m²
Summer ventilation window	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Summer ventilation mechanically	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Total humidity load	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Dehumidification by supply air cooling	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Dehumidification by circulation cooling	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Additional dehumidification	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Total dehumidification	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	
Unnecessary dehumidification	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²
Missing dehumidification	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0	kWh/m²



Cooling load

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Building type: **Maison unifamiliale individuelle**

Treated floor area A_{TFA}:	319,8	m²	Spec. capacity:	132	Wh/(m²K)
Building volume:	793	m³	Nominal humidity:	12,0	g/kg
Interior temperature:	25	°C	Internal humidity sources:	2,0	g/kg

Temperature:	Outdoor air		Dew point		Sky	
Weather 1:	26,0	°C	16,9	°C	14,3	°C
Weather 2:	26,0	°C	16,9	°C	16,9	°C
Ground design temp.	23,8	°C		SHX	12,5	°C

Radiation:	North	East	South	West	Horizontal	
Weather 1:	100	170	180	170	340	W/m²
Weather 2:	100	170	180	170	340	W/m²

Building assembly	Temperature zone	Area m²		U-Value W/(m²K)		Factor always 1 (except "X")		TempDiff 1 K		TempDiff 2 K		P_T 1 W		P_T 2 W
External wall - Ambient	A	299,4	*	0,780	*	1,00	*	1,0	or	1,0	=	242	or	242
External wall - Ground	B	56,0	*	3,651	*	1,00	*	-1,2	or	-1,2	=	-252	or	-252
Roof/Ceiling - Ambient	A	217,2	*	0,090	*	1,00	*	1,0	or	1,0	=	20	or	20
Floor slab / Basement ceiling	B	213,6	*	2,098	*	1,00	*	-1,2	or	-1,2	=	-554	or	-554
	A		*		*	1,00	*	1,0	or	1,0	=		or	
	A		*		*	1,00	*	1,0	or	1,0	=		or	
	X		*		*	0,75	*	1,0	or	1,0	=		or	
Windows	A	54,3	*	2,461	*	1,00	*	1,0	or	1,0	=	138	or	138
Exterior door	A		*		*	1,00	*	1,0	or	1,0	=		or	
Exterior TB (length/m)	A	216,3	*	0,199	*	1,00	*	1,0	or	1,0	=	45	or	45
Perimeter TB (length/m)	P	63,5	*	0,000	*	1,00	*	-1,2	or	-1,2	=	0	or	0
Ground TB (length/m)	B	32,8	*	0,056	*	1,00	*	-1,2	or	-1,2	=	-2	or	-2
Building element towards neighbour	I		*		*	1,00	*	3,0	or	3,0	=		or	
Radiation correction outdoor air				$L_{ambient}$ W/K		-28,5	*	1,0	or	1,0	=	-30	or	-30
Radiation correction sky				L_{Sky} W/K		24,5	*	-10,7	or	-8,1	=	-261	or	-199
Transmission heat load P_T										Total	=	**-654**	or	**-591**

Ventilation load	V_V m³		$n_{V,equi,fraction}$ 1/h		$n_{V,equi,fraction}$ 1/h		c_{Air} Wh/(m³K)		TempDiff 1 K		TempDiff 2 K		P_V 1 W		P_V 2 W
Exterior $P_{V,e}$	793	*	0,330	or	0,330	*	0,33	*	1,0	or	1,0	=	90	or	90
Ground $P_{L,e}$	793	*	0,000	or	0,000	*	0,33	*	-12,5	or	-12,5	=	0	or	0
Summer ventilation $P_{L,S}$	793	*	0,000	or	0,000	*	0,33	*	0,0	or	0,0	=	0	or	0
Ventilation heat load P_V												Total	**90**	or	**90**

Orientation of the area	Area m²		g-Value (perp. radiation)		Reduction factor (see 'Windows' worksheet)		Radiation 1 W/m²		Radiation 2 W/m²		P_T 1 W		P_T 2 W
North	10,2	*	0,3	*	0,09	*	108	or	108	=	33	or	33
East	17,0	*	0,8	*	0,10	*	181	or	181	=	227	or	227
South	13,1	*	0,8	*	0,14	*	181	or	181	=	256	or	256
West	14,0	*	0,8	*	0,14	*	150	or	150	=	228	or	228
Horizontal	0,0	*	0,0	*	0,40	*	340	or	340	=	0	or	0
Sum opaque areas											1337	or	1337
Solar load P_S										Total	**2081**	or	**2081**

Internal heating load P_I	Spec. power W/m²		A_{TFA} m²		P_I 1 W		P_I 2 W
	2,3	*	320	=	**722**	or	**722**

$P_T + P_V + P_S + P_I$	=	**2238**	or	**2301**
Cooling load P_C	=		**2301**	**W**
Area specific cooling load P_C / A_{TFA}	=		**7,2**	**W/m²**

Please enter the minimum supply air temperature. **3** °C

Supply air temperature without cooling $\vartheta_{Supply,Min}$ = **26,0** °C / **26,0** °C

For comparison: cooling load, transportable through the supply air $P_{Supply;Max}$ = **1284** W / **1284** W

specific: 4,0 W/m² / 4,0 W/m²

Air conditioning over the supply air possible? (yes/no) **No**

Daily internal temperature stroke

	Transmission W		Ventilation W		Solar load W		Time h/d		Spec. capacity Wh/(m²K)		A_{TFA} m²		
	(-591,1	+	89,5	+	2081,2	) *	24	/ (	132	*	320	) =	**0,9** K

Dehumidific. load

from 'Cooling' worksheet

Absolute humidity exterior air	12,1	or	12,1	g/kg	Absolute humid. supply air	12,1	or	12,1	g/kg
Outdoor air mass flow	110	or	110	kg/h	Supply air mass flow	199	or	199	kg/h
Summer vent. air mass flow	0	or	0	kg/h	**Humid. load, supply air**	10	or	10	g/h
Humidity load, outdoor air	6	or	6	g/h	**Humidity load, internal**	640	or	640	g/h

	Enthalpy of vaporisation Wh/kg		g/kg		Humidity load g/h		Humidity load g/h		P_D 1 W		P_D 2 W
	707,639	/	1000	*	655	or	655	=	**464**	or	**464**
Dehumidification load P_T								=		**464**	**W**
Area specific dehumidification load P_T / A_{TFA}								=		**1,5**	**W/m²**

Monthly average values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Specific cooling demand	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	kWh/m²
Specific dehumidification demand	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	kWh/m²
Sensible fraction	100%	100%	100%	100%	100%	100%	62%	100%	100%	100%	100%	100%	

Minimum of sensible cooling load fraction occurred **100%**

Heat distribution and domestic hot water (DHW) system

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Interior temperature:	20	°C	Interior temperature summer:	25	°C
Building type:	Maison unifamiliale individuelle				
Treated floor area A_{TFA}:	320	m²			
Occupancy:	3,2	Pers			
Number of dwelling units:	1				
Annual heating demand $q_{Heating}$	34049	kWh/a	Annual useful cooling dem. q_{Cool}	24	kWh/a
Length of heating period:	191	d	Length cooling period:	153	d
Average heating load P_{ave}:	7,4	kW	Average cooling load $P_{Average}$:	0,0	kW
Marginal usability of additional heat gains:	100%		Marginal utility of additional heat losses:	0%	

Space heat distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Length of distribution pipes	L_H	m												
Nominal width of pipe		mm												
Insulation thickness		mm												
Insulation reflective coating?		-												
Thermal conductivity of insulation		W/(mK)												
Heat loss coefficient per m of insulated pipe		W/(mK)												
Insulation quality of mountings, pipe suspensions, etc.		-	1-None	1-None	1-None	1-None	1-None	1-None	1-None	1-None	1-None	1-None		
Thermal bridge supplement		W/K												
Total heating loss coefficient per m of pipe	Ψ	W/(mK)												
Temp. of the room through which the pipes pass	ϑ_x	°C	20	20	20	20	20							
Design forward flow temperature	ϑ_V	°C												
Design system heating load	$P_{heating}$	kW												
Forward flow temperature control ('x' if applicable)														
Design return flow temperature	ϑ_R	°C												
Annual heat emission per m of plumbing	q^*_{HL}	kWh/(m·a)												
Possible utilisation factor of released heat	η_G	-												
Annual heat losses of heating distribution	Q_{HL}	kWh/a											kWh/a **0**	kWh/(m²a) **0,0**
Annual heat losses of heating storage		kWh/a											**0**	**0,0**
Annual heat losses of heating		kWh/a											**0**	**0,0**
Performance ratio of heat distribution	$ea_{,HL}$	-											**100%**	

DHW useful heat

DHW demand for showers, per person and day (with 60°C)		litre/person/d	16,0
DHW demand others, per person and day (with 60°C)		litre/person/d	9,0
Performance of shower drain-water heat recovery		-	0%
Effective DHW demand	V_{DHW}	litre/person/d	25
Average cold water temperature of the supply	ϑ_{TW}	°C	12,5
DHW demand for washing machines and dishwashers non-elect		kWh/a	0
Effective useful heat DHW	Q_{DHW}	kWh/a	1621

kWh/a	kWh/(m²a)
1621	5,1

Auxiliary calculation - DHW demand calculation (for non-res)

Auxiliary calculation - shower drain-water heat recovery

DHW distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Temp. of room through which the pipes pass	ϑ_X	°C	20,0	20,0	20,0	20,0	20,0	**12,0**	12,0	12,0	12,0	12,0		
Design forward flow temperature	ϑ_{dist}	°C	**50,0**	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0		
DHW circulation pipes														
Length of circulation pipes (forward + return flow)	L_{HS}	m												
Nominal width of pipe		mm												
Insulation thickness		mm												
Insulation reflective coating?		-												
Thermal conductivity of insulation		W/(mK)												
Heat loss coefficient per m of insulated pipe		W/(mK)												
Insulation quality of mountings, pipe suspensions, etc.		-	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**	**1-None**		
Thermal bridge supplement		W/K												
Total heating loss coefficient per m of pipe	Ψ	W/(mK)												
Daily circulation period of operation.	td_{Circ}	h/d												
Design return flow temperature	ϑ_R	°C												
Circulation period of operation per year	t_{Circ}	h/a												
Annual heat released per m of pipe	q^*_Z	kWh/m/a												
													kWh/a	kWh/(m²a)
Annual heat loss from circulation lines	QZ	kWh/a											**0**	**0,0**
DHW individual pipes														
Exterior pipe diameter	d_{U_Pipe}	m	**0,012**											
Accumulated length per single pipes	L_U	m	**65,50**											
Amount of tapping points in building	$n_{tapping\ point}$	-	**10,00**											
Average pipe length per tapping point	$L_{U,\ average}$	m	6,6											
Tap openings per person per day		-	**3**											
Utilisation days per year		d	**365**											
Heat loss per tap opening	$q_{Individual}$	kWh/tap opening	0,0176											
Amount of tap openings per year and person	n_{Tap}	Tap openings per year	1095											
													kWh/a	kWh/(m²a)
Annual heat loss of individual pipes	Q_U	kWh/a	**62**										**62**	**0,2**
													kWh/a	kWh/(m²a)
Total heat losses of DHW distribution	Q_{WL}												**62**	**0,2**
Performance ratio of DHW distribution pipes	ea_{HL}	-											**104%**	

Storage heat losses

		Storage 1	Storage 2	Buffer storage tank (only heating)	Compact unit		
Selection of storage tank		2-DHW only	0-No storage tank	0-No storage tank	0-No		
Storage necessary for HP							
Solar DHW connection		x					
Heat loss rate	W/K	3,0	3,0				
Storage volume	litre	300			---		
Standby fraction	-						
Location of storage tank, inside or outside of thermal envelope		2-Outside	1-Inside	2-Outside			
Temperature of mechanical room	°C	12,0					
Typical storage tank temperature	°C	50,0					
Manual entry of storage temperature	°C						
Average standby heat losses storage tank	W	34					
Additional heat losses storage tank, solar operation	W	80		---	---		
Possibly utilisation factor of heat losses		---	---		---		
Annual heat losses DHW storage tank	kWh/a	999		---		kWh/a	kWh/(m²a)
						999	3,1
Annual heat losses buffer storage tank		---	---		---		

Auxiliary calculation - heat losses through storage tank according to EU efficiency classes

Total energy demand of domestic hot water

		kWh/a	kWh/(m²a)
Heat losses of DHW distribution and storage	Q_{WL}	1061	3,3
Performance ratio DHW-distribution + storage	$e_{a,WL}$	165%	
Total heating demand of DHW system		kWh/a	kWh/(m²a)
Including storage tank	Q_{gDHW}	2681	8,4

Cooling distribution

			Inside thermal envelope					Outside thermal envelope					Total values	
			1	2	3	4	5	1	2	3	4	5	Absolute	Specific
Length of distribution pipes	L_H	m												
Nominal width of pipe		mm												
Insulation thickness		mm												
Insulation reflective coating?		-												
Thermal conductivity of insulation		W/(mK)												
Heat loss coefficient per m pipe	Ψ	W/(mK)												
Temp. of room through which the pipes pass	ϑ_X	°C	25,0	25,0	25,0	25,0	25,0	**25,0**	25,0	25,0	25,0	25,0		
Design forward flow temperature	ϑ_V	°C	**6,0**	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0	6,0		
Dimensioning of cooling load of the system	$P_{heating}$	kW												
Forward flow temperature control ('x' if applicable)														
Design return flow temperature	ϑ_R	°C												
Annual heat absorption per m of pipe	q^*_{HL}	kWh/(m·a)												
Possibly utilisation factor of this heat absorption	η_G	-												
Annual heat losses of cooling distribution	Q_{HL}	kWh/a											kWh/a: **0**	kWh/(m²a): **0,0**
Performance ratio cold water distribution pipes	$ea_{,HL}$	-											**100%**	

Solar thermal system

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Building type:	Maison unifamiliale individuelle	
Treated floor area A_{TFA}:	319,8	m²
Projected building footprint $A_{Projected}$:	225,8	m²
Latitude *('Climate' worksheet)*	45,8	°
DHW demand *('DHW+Distribution')*	2681	kWh/a
Heating demand ('Heating' and 'DHW+Distribution' worksheets)	34049	kWh/a
Occupancy	3,2	Persons

Location: Selection in 'Areas' worksheet		27-Toiture R+1		**Collector**	7-Improved flat place collector
Size of selected area		223	m²	Heating support (please check, if applicable)	
Free area (less solar thermal and electrical systems)		223,1	m²	DHW priority (check if appropriate)	x
Deviation from North		180	°		
Angle of inclination from the horizontal		20	°		
Alternative input: Deviation from North		180	°		
Alternative input: Angle of inclination from the horizontal		20	°		
Solar collector area		0,00	m²		
Specific collector area		0,0	m²/Pers		
Height of the collector field		1,00	m		
Height of horizon	h_{Hori}	0,00	m		
Horizontal distance	a_{Hori}	1000,00	m		
Additional reduction factor shading	r_{other}				

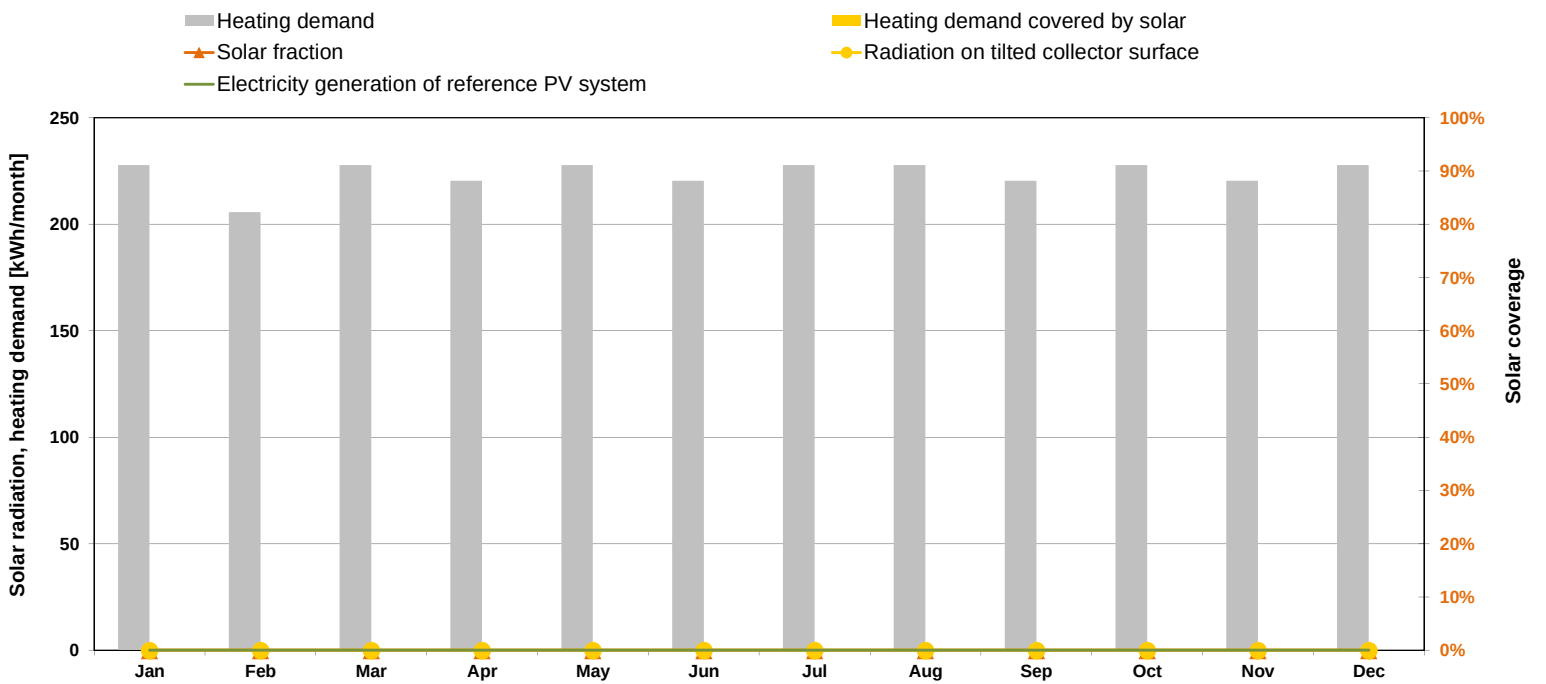
Results

	Projected building footprint area kWh/(m²Projected*a)	Absolute kWh/a
Solar contribution total 0%	0,0	0
Solar contribution to DHW 0%	0,0	0
Solar contribution to space heating 0%	0,0	0

			kgCO2eq/ m²Projected*a	kgCO2eq/a
2-CO2-Factors user determined	kgCO2eq/ kWhFinal	0,000	0,0	0

Determination of PER factors

Yield reference PV syst. kWhel/a	PERel kWhprim-el/kWhel	PERsol.therm kWhth/kWhprim-el*kWhprim/kWhel
	1,25	
	1,75	



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
Heating demand DHW-preparation	228	206	228	220	228	220	228	228	220	228	220	228	2681	kWh/month
Space heating demand	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Heating demand	228	206	228	220	228	220	228	228	220	228	220	228	2681	kWh/month
Radiation on tilted collector surface	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Please enter: Solar production for DHW													0	kWh/month
Please enter: Solar production for heating													0	kWh/month
DHW heating demand covered by solar	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Space heating demand covered by solar	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Heating demand covered by solar	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month
Solar fraction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
Electricity generation of reference PV system	0	0	0	0	0	0	0	0	0	0	0	0	0	kWh/month

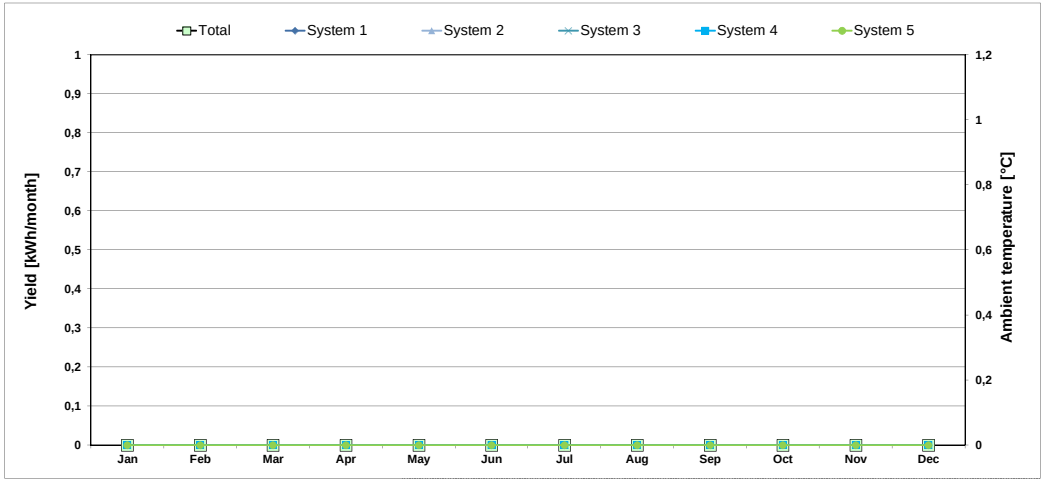
Photovoltaic systems

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Climate data set: FR0004a-Lyon
Building type: Maison unifamiliale individuelle
Projected building footprint: 225,8 m²

		System 1	System 2	System 3	System 4	System 5	Reference PV syst.	
Name of system								
Location: Selection in 'Areas' worksheet							27-Toiture R+1	
Size of selected area							223,1	m²
Deviation from North							180	°
Angle of inclination from horizontal							20	°
Alternative input: Deviation from North								°
Alternative input: Angle of inclination from the horizontal								°
Information from the module data sheet								
Technology		5-Poly-Si	5-Poly-Si	5-Poly-Si	5-Poly-Si	5-Poly-Si	4-Mono-Si	
Nominal current	I_{MPP0}						7,71	A
Nominal voltage	U_{MPP0}						30,50	V
Nominal power	P_n	0	0	0	0	0	235	Wp
Temperature coefficient short-circuit current	α						0,040	%/K
Temperature coefficient open-circuit voltage	β						-0,340	%/K
Module dimensions: Height							1,658	m
Module dimensions: Width							0,994	m
							1,6	Module area [m²]
Further specifications								
Number of modules	n_M						0,0	
Height of module array							1	m
Height of horizon	h_{Hori}						0	m
Horizontal distance	a_{Hori}						1000,0	m
Additional reduction factor shading	r_{other}							
Efficiency of the inverter	η_{INRV}						95%	
Results								
Area of module field		0,0	0,0	0,0	0,0	0,0	0,0	m²
Free area on the selected building element							223,1	m²
Allocation to building element							0%	
Annual losses due to shading								kWh

		Total	
Annual electricity yield of the inverter, absolute		0	kWh/a
Related to projected building footprint area		0	kWh/m²A_{Proje}
CO2-equivalent emissions according to 2-CO2-Factors user determined		0,0	kg/a
PE-factor according to 1-PE-factors (non-renewable) PHI Certification	0,00 0,00 0,00 0,00 0,00 0,0	#DIV/0!	kWh$_{prim}$/kWh$_l$



Electricity demand for residential buildings

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Households	1
Persons	3,2
Living area (m²)	320
Heating demand [kWh/(m²a)]	106,5

PER and PE factors (KWh/kWh)		
Electricity:	1,25	2,6
Non-electric energy carrier for cooking, drying:	1,25	2,6
Energy carrier for heating:	1,64	2,6
Energy carrier for DHW:	1,25	2,6

Solar fraction of DHW Laundry&Dish	
Marginal performance ratio DHW	
Marginal performance ratio Heating	

Column no.	1	2	3				4		5		6			7		8	8a		9		10		11		12		13
Application	Used ? (1/0)	Within the thermal envelope? (1/0)	Norm demand				Utilisation factor		Frequency		Reference quantity			Useful energy (kWh/a)		Electric fraction	Non-electric fraction		**Electricity demand (kWh/a)**		Additional demand		Marginal performance ratio		Solar fraction		Non-electric demand (kWh/a)
Dishwashing	1	1	1,10	kWh/Use		*	1,00	*	65	/(P*a)	* 3,2	P	=	230	*	100%		=	230								
															*		0%				* (1+	0,30	) *	1,00	*(1-		) =	
Clothes washing	1	1	1,10	kWh/Use		*	1,00	*	57	/(P*a)	* 3,2	P	=	202	*	100%		=	202								
															*		0%				* (1+	0,05	) *	1,00	*(1-		) =	
Clothes drying with:	1	0	3,50	kWh/Use	Residual dampness	*	0,88	*	57	/(P*a)	* 3,2	P	=	0		0%		=	0								
1-Clothes line					0,60								=	0			0%						1,00	*			0
Energy consumed by evaporation	1	0	0,00	kWh/Use		*	0,60	*	57	/(P*a)	* 3,2	P	=	0	*		100%				* (1+	0,00	) *	1,00	*(1-	0,41	) =	0
Refrigerating	1	1	0,78	kWh/d		*	1,00	*	365	d/a	* 1	HH	=	285	*	100%		=	285								
Freezing	1	1	0,88	kWh/d		*	1,00	*	365	d/a	* 1	HH	=	321	*	100%		=	321								
or combination	0	1	1,00	kWh/d		*	1,00	*	365	d/a	* 1	HH	=	0	*	100%		=	0								
Cooking with:	1	1	0,25	kWh/Use		*	1,00	*	500	/(P*a)	* 3,2	P	=	402	*	100%		=	402								
1-Electricity					Average lamp efficiency [lm/W]										*		0%										0
Lighting	1	1	11	W	65	*	1,00	*	2,90	kh/(P*a	* 3,2	P	=	103	*	100%		=	103								
Consumer electronics	1	1	80	W		*	1,00	*	0,55	kh/(P*a	* 3,2	P	=	142	*	100%		=	142								
Small appliances, etc.	1	1	50	kWh		*	1,00	*	1,00	/(P*a)	* 3,2	P	=	161	*	100%		=	161								
Total aux. electricity														593					593								
Other:																											
				kWh/a										0					0								
				kWh/a										0					0								
				kWh/a										0					0								
Total														2439	kWh				**2439**	kWh			DHW Non-Electric - Wash&Dish **0**	kWh			**0**
Specific demand																			**7,6**	kWh/(m²a)			Non-Renewable Non-Electric DHW Wash&Dish **0,0**	kWh/(m²a)			**0,0**
Recommended maximum value																			18								

Use non-residential buildings

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Latitude [°]: 46

	Utilisation pattern	Begin utilisation [h]	End utilisation [h]	Daily utilisation hours [h/d]	Annual utilisation days [d/a]	Annual utilisation hours [h/a]	Annual utilisation hours during daytime [h/a]	Annual utilisation hours during night-time [h/a]	Daily operating hours of heating	Daily operating hours of ventilation	Lighting	Illumination level [lux]	Height of utilisation level (0.8 or 0.0 m)	Height of utilisation level (0.8 or 0.0 m)	Relative absenteeism	Part use factor of building operating period for lighting	Average occupancy [m²/Pers.]
1				0		0	0	0	2	2				0,8			
2				0		0	0	0	2	2				0,8			
3				0		0	0	0	2	2				0,8			
4				0		0	0	0	2	2				0,8			
5				0		0	0	0	2	2				0,8			
6				0		0	0	0	2	2				0,8			
7				0		0	0	0	2	2				0,8			
8				0		0	0	0	2	2				0,8			
9				0		0	0	0	2	2				0,8			
10				0		0	0	0	2	2				0,8			
11				0		0	0	0	2	2				0,8			
12				0		0	0	0	2	2				0,8			
13				0		0	0	0	2	2				0,8			
14				0		0	0	0	2	2				0,8			
15				0		0	0	0	2	2				0,8			
16				0		0	0	0	2	2				0,8			
17				0		0	0	0	2	2				0,8			
18				0		0	0	0	2	2				0,8			
19				0		0	0	0	2	2				0,8			
20				0		0	0	0	2	2				0,8			
21	Single office	7	18	11	250	2750	2543	207	13			500	0,8	0,8	0,30	0,70	10,00
22	Group office	7	18	11	250	2750	2543	207	13			500	0,8	0,8	0,30	0,70	
23	Open-plan office	7	18	11	250	2750	2543	207	13			500	0,8	0,8	0,00	1,00	15,00
24	Meeting	7	18	11	250	2750	2543	207	13			500	0,8	0,8	0,50	1,00	2,00
25	Counter area	7	18	11	250	2750	2543	207	13			200	0,8	0,8	0,00	1,00	
26	Retail	8	20	12	300	3600	2999	601	14			300	0,8	0,8	0,00	1,00	7,00
27	Classroom	8	15	7	200	1400	1398	2	9			300	0,8	0,8	0,25	0,90	2,00
28	University auditorium	8	18	10	150	1500	1409	91	12			500	0,8	0,8	0,25	0,70	0,75
29	Bedroom	0	24	24	365	8760	4407	4353	24			300	0,8	0,8	0,00	0,50	
30	Hotel room	21	8	11	365	4015	755	3260	24			200	0,8	0,8	0,25	0,30	
31	Canteen	8	15	7	250	1750	1748	2	9			200	0,8	0,8	0,00	1,00	
32	Restaurant	10	0	14	300	4200	2404	1796	16			200	0,8	0,8	0,00	1,00	1,50
33	Kitchen non-residential	10	23	13	300	3900	2404	1496	15			500	0,8	0,8	0,00	1,00	
34	Kitchen, Storage, Preparation	7	23	16	300	3900	2404	1496	15			300	0,8	0,8	0,50	1,00	
35	WC, Sanitary	7	18	11	250	2750	2543	207	13			200	0,8	0,8	0,90	1,00	
36	Other habitable rooms	7	18	11	250	2750	2543	207	13			300	0,8	0,8	0,50	1,00	
37	Secondary areas	7	18	11	250	2750	2543	207	13			100	0,8	0,8	0,90	1,00	
38	Circulation area	7	18	11	250	2750	2543	207	13			100	0,0	0,0	0,80	1,00	
39	Storage, Services	7	18	11	250	2750	2543	207	13			100	0,8	0,8	0,98	1,00	
40	Server room	0	24	24	365	8760	4407	4353	24			500	0,8	0,8	0,50	0,50	
41	Workshop	7	16	9	250	2250	2192	58	11			500	0,8	0,8	0,00	1,00	
42	Theatre auditorium	19	23	4	250	1001	55	946	6			200	0,8	0,8	0,00	1,00	
43	Theatre foyer	19	23	4	250	1001	55	946	6			300	0,8	0,8	0,50	1,00	
44	Theatre stage	13	23	10	250	2500	1253	1247	12			1000	0,8	0,8	0,00	0,60	
45	Fair, Congress	13	18	5	150	1350	1260	90	11			300	0,8	0,8	0,50	1,00	
46	Exhibition	10	18	8	250	2001	1850	151	24			200	0,8	0,8	0,00	1,00	
47	Library reading room	8	20	12	300	3600	2999	601	14			500	0,8	0,8	0,00	1,00	
48	Open access library	8	20	12	300	3600	2999	601	14			200	0,8	0,8	0,00	1,00	
49	Library repository	8	20	12	300	3600	2999	601	14			100	0,8	0,8	0,90	1,00	
50	Gymnasium	8	23	15	300	4500	3002	1498	17			300	0,8	0,8	0,30	1,00	
51	Parking garage	7	18	11	250	2750	2543	207	0			75	0,0	0,0	0,95	1,00	
52	Public parking garage	9	0	15	365	5475	3290	2185	0			75	0,0	0,0	0,80	1,00	

Electricity demand for non-residential buildings (at the moment this worksheet is inactive. Calculation takes place in the 'Electricity' worksheet).

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Treated floor area A_{TFA}:	319,8	m²
Auxiliary electricity demand:	593,3	kWh/a

	PER factors:	PE factors:	
Electricity:	1,25	2,6	kWh/kWh
RE gas / Natural gas:	1,75	1,1	kWh/kWh
Energy carrier for DHW:		1,1	kWh/kWh
Solar fraction of DHW	0%		
Marginal performance ratio DHW:			

Window properties (from 'Windows' worksheet):

	Shading	Dirt factor	Non-perpendicular radiation	Glazing fraction
North	0,31	0,95	0,85	0,72
East	0,52			0,52
South	0,54			0,63
West	0,70			0,55

				Facade with windows				Geometry: input of a typical room																
Lighting / non-residential	Net ground area		Room category	Power of nominal lighting	Deviation from North	Orientation	Light transmission glazing	Window existing?	Room depth	Room width	Room height	Lintel height	Window width	Daylight utilisation	User data: Installed lighting power	Installed lighting power (standard)	Lighting control	Motion detector used?	Lighting check		Utilisation hours per year	User determined: Lighting full load hours	Full load hours of lighting	Electricity demand (kWh/a)	Spec. electricity demand (kWh/(m²a))
Room / Zone	m²			Lux	Degrees		-	[x]	m	m	m	m	m		W/m²	W/m²		[x]			h/a	h/a	h/a	kWh/a	kWh/(m²a)
				15																		9			
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					
							69%							None		0,0	1	0	Manual	Without motion detector					

Office equipment	Room category	Within the thermal envelope [1/0]	Existing [1/0]		Quantity		Power consumption [W]		Utilisation hours per year [h/a]		Relative absenteeism			Duration of utilisation in energy saving mode [h/a]		Useful energy (kWh/a)		Electricity demand [kWh/a]
	2								9	20	18							
PC 1		1	0	*	6	*	80	* (	0	* (1-	0	)			=	0	=	0,0
PC in energy saving mode		1			6	*	2,0	*	0	*	0				=	0	=	0,0
Monitor 1		1	0	*	6	*	28	* (	0	* (1-	0	)			=	0	=	0,0
Monitor in energy saving mode		1			6	*	2,0	*	0	*	0				=	0	=	0,0
PC 2		1	0	*	0	*	80	* (	0	* (1-	0	)			=	0	=	0,0
PC in energy saving mode		1			0	*	2,0	*	0	*	0				=	0	=	0,0
Monitor 2		1	0	*	0	*	28	* (	0	* (1-	0	)			=	0	=	0,0
Monitor in energy saving mode		1			0	*	2,0	*	0	*	0				=	0	=	0,0
Copier		1	0	*	1	*	400	* (	0				-	0	) =	0	=	0,0
Copier in energy saving mode		1			1	*	30	*	0						=	0	=	0,0
Printer		1	0	*	2	*	300	* (	0				-	0	) =	0	=	0,0
Printer in energy saving mode		1			2	*	2	*	0						=	0	=	0,0
Server		1	0	*	1	*	100	* (	0						=	0	=	0,0
Server in energy saving mode		1			1	*	2,0	* (	8760				-	0	) =	0	=	0,0
Telephone system		1	0	*	1	*	94	*	8760						=	0	=	0,0
				*		*		*	20						=	0	=	0,0
				*		*		*							=	0	=	0,0
				*		*		*							=	0	=	0,0
				*		*		*							=	0	=	0,0
				*		*		*							=	0	=	0,0

Kitchen / Aux. electricity	Room category (predominant utilisation pattern of building)	Within the thermal envelope [1/0]	Existing [1/0]		Utilisation hours per year [h/a]		Number of meals per day of use		Norm consumption		Useful energy [kWh/a]		Non-electric fraction	Electric fraction	Additional demand	Marginal performance ratio	Solar fraction		Non-electric demand (kWh/a)		Electricity demand [kWh/a]
					8				kWh / Meal												
Cooking:		1	0	*	0	*		*	0,25	=	0	{ *		0%				=			0,0
Electricité									kWh / Cover			*	0%					=	0		
Dishwashing		1	0	*	0	*	0	*	0,10	=	0	{ *		55%				=			0,0
Raccordement eau froide									kWh/d			*	0%	* (1+	0,30	) * 1,20	*(1- 0,00	) =	0		
Refrigerating		1	0		365					=	0	*		100%				=			0,0
											0	*		100%				=			0,0
											0	*		100%				=			0,0
											0	*		100%				=			0,0
											0	*		100%				=			0,0
											0	*		100%				=			0,0
											0	*		100%				=			0,0
											0	*		100%				=			0,0
											0	*		100%				=			0,0
Total auxiliary electricity											593					Hot water non-electric dishwashing					593,3

Total	593	kWh	0	0,0	593	kWh/a	kW
Specific demand			0,0	0,0	2	kWh/(m²a)	kW

Aux Electricity

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Treated floor area	320	m²
Heating period	191	d
Air volume	793	m³
Dwelling units	1	HH

Heat recovery efficiency ventilation unit	0,00	
Operation vent. system Winter	4,58	kh/a
Operation vent. system Summer	4,18	kh/a
Air change rate	0,21	h⁻¹

Annual space heating demand	106	kWh/(m²a)
Boiler rated power	15	kW
DHW system heating demand	2681	kWh/a
Design forward flow temperature		°C

Column no.	1	2	3		4		5		6		7		8		9		10	11
Application	Existing [1/0]	Within the thermal envelope [1/0]	Norm demand		Utilisation factor		Period of operation		Reference size		Electricity demand [kWh/a]		Available as interior heat		Utilisation period [h/a]		Internal heat gains winter [W]	Internal heat gains summer [W]
Ventilation system																		
Winter ventilation	1		0,40	Wh/m³	* 0,21	h⁻¹	* 4,6	kh/a	* 793	m³	= 310		considered in heat recovery efficiency					
Defroster HX	0	1	Data entries in 'Ventilation' worksheet or in 'Addl vent'								0	*	1,0	/	4,58	=	0	
Summer ventilation	1	0,55	0,40	Wh/m³	* 0,21	h⁻¹	* 4,2	kh/a	* 793	m³	= 283	*	1,0	/	4,18	=		37
																	Internal heat sources ' Additional summer ventilation'	0,0
Additional vent. summer	0		0,00	Wh/m³	* 0,00	h⁻¹	* 4,2	kh/a	* 793	m³	= 0	*	1,0	/	4,18	=		
Heating system			Controlled / non controlled															
Enter the rated power of the pump				W														
Circulator pump heating			80	W	* 1,0		* 4,6	kh/a	* 1		= 0	*	1,0	/	4,58	=	0	
Boiler electricity consumption at 30% load				W														
Aux. energy - Heat. boiler	0	0	55	W	* 1,00		* 0,00	kh/a	* 1		= 0	*	1,0	/	4,58	=	0	
Aux. energy - Wood fired/Pellet boiler	0	0	Data entries in 'Boiler' worksheet. Aux. energy demand including possible drinking water production.								0	*	1,0	/	4,58	=	0	
DHW system																		
Enter average power consumption of pump				W														
Circulation pump DHW	0		30	W	* 1,00		* 5,6	kh/a	* 1		= 0	*	1,0	/	8,76	=	0	0
Enter the rated power of the pump				W														
Storage load pump DHW			69	W	* 1,00		* 0,0	kh/a	* 1		= 0	*	1,0	/	8,76	=	0	0
Boiler electricity consumption at 100% load				W														
DHW boiler aux. energy	0	0	165	W	* 1,00		* 0,0	kh/a	* 1		= 0	*	1,0	/	8,76	=	0	0
Enter the rated power of the solar DHW pump				W														
Solar aux. electricity	0	1	51	W	* 1,00		* 1,8	kh/a	* 1		= 0	*	1,0	/	8,76	=	0	0
Aux. electricity cooling and dehumidification																		
Aux. electricity cooling				kWh/a	* 1,00		* 1,0		* 1		= 0	*	1,0	/	4,18	=		0
Aux. electricity dehum.				kWh/a	* 1,00		* 1,0		* 1		= 0	*	1,0	/	4,18	=		0
Misc. aux. electricity																		
Misc. aux. electricity				kWh/a	* 1,00		* 1,0		* 1		= 0	*	1,0	/	8,76	=	0	0
Total											593						0	37
Specific demand	kWh/(m²a) (treated floor area)										1,9							

Internal heat gains for residential buildings (at the moment this worksheet is inactive)

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Utilisation: 10-Dwelling

Type of values used: 2-Standard

IHG heating 2,26 W/m²

IHG cooling 2,26 W/m²

No input is necessary

Go to utilisation pattern selection

Persons	3,2	P
Living area	320	m²

Heating demand	106	kWh/(m²a)
Heating period	191	d/a

Application	Existing [1/0] or occupancy	Within the thermal envelope [1/0]	Norm consumption		Utilisation factor	Frequency		Useful energy [kWh/a]		Included in electricity balance?		Availability		Utilisation period [h/a]		Internal heat gains [W]
Dishwashing	1	1	1,1	kWh/Use	1,00	65	/(P*a)	230	*			0,30	/	8,76	=	8
Clothes washing	1	1	1,1	kWh/Use	1,00	57	/(P*a)	202	*			0,30	/	8,76	=	7
Clothes drying with:	1	0	3,5	kWh/Use	0,88	57	/(P*a)	0	*			1,00	/	8,76	=	0
1-Clothes line		0	0,0					0				0,80				
Energy consumed by evaporation	1	0	0,0	kWh/Use	0,60	57	/(P*a)	0	* (1-	0	) *	1,00	/	8,76	=	0
Refrigerating	1	1	0,8	kWh/d	1,00	365	d/a	285	*			1,00	/	8,76	=	33
Freezing	1	1	0,9	kWh/d	1,00	365	d/a	321	*			1,00	/	8,76	=	37
or combination	0	1	1,0	kWh/d	1,00	365	d/a	0	*			1,00	/	8,76	=	0
Cooking	1	1	0,3	kWh/Use	1,00	500	/(P*a)	402	*			0,50	/	8,76	=	23
Lighting	1	1	11,0	W	1,00	2,9	kh/(P*a)	103	*			1,00	/	8,76	=	12
Consumer electronics	1	1	80,0	W	1,00	0,55	kh/(P*a)	142	*			1,00	/	8,76	=	16
Household appliances/Other	1	1	50,0	kWh	1,00	1,0	/(P*a)	161	*			1,00	/	8,76	=	18
Auxiliary appliances (cf. aux Electricity sheet)															=	0
Other applications (cf. Electricity sheet)	0	0,0						0	*			0	/	8,76	=	0
Persons	3	1	80,0	W/P	1,00	8,76	kh/a	2256	*			0,55	/	8,76	=	142
Cold water	3	1	-12,8	W/P	1,00	8,76	kh/a								=	-41
DHW - circulation	0	0	0,0	W	1,00	8,76	kh/a	0	*			1,00	/	8,76	=	0
DHW - individual pipes	1	1	7,1	W	1,00	8,76	kh/a	62	*			1,00	/	8,76	=	7
DHW storage tank heating case	1	0	0,0	W	1,00	8,76	kh/a	0	*			1,00	/	8,76	=	0
DHW storage tank cooling case	1	0	0,0	W	1,00	8,76	kh/a	0	*			1,00	/	8,76	=	0
Evaporation	3	1	-25,0	W/P	1,00	8,76	kh/a	-705	*			1,00	/	8,76	=	-80
Total IHG														W		180
Specific IHG														W/m²		0,56
Heat available from internal sources										191	d/a			kWh/(m²a)		2,6

Internal heat gains for non residential buildings (at the moment this worksheet is inactive)

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Utilisation: 10-Dwelling — IHG 2,26 W/m²

Type of values used: 2-Standard — No input is necessary

Persons: 3,2 P — Treated floor area: 319,8498 m² — Heating period: 191 d/a — Room temperature: 20 °C — Internal heat gains aux. electricity: 0 W

Persons	Selection of user profile	Select	Activity of persons	Planning 0 = according to ground area or usable zone 1 = according to occupancy	Number of occupants		Ground area of useful zone [m²]	Average occupancy [Pers./m²]	Heat emitted per person [W]	Utilisation hours per year [h/a]	Relative presence	Utilisation period [h/a]	Average heat release persons [W]
								27		9	18		
Persons A			Invalid input		{	}* or	{	* Not a standard value	} * 0	* 0	* 1,00	/ 8760	= 0
Persons B			Invalid input		{	}* or	{	* Not a standard value	} * 0	* 0	* 1,00	/ 8760	= 0
Persons C			Invalid input		{	}* or	{	* Not a standard value	} * 0	* 0	* 1,00	/ 8760	= 0
Persons D			Invalid input		{	}* or	{	* Not a standard value	} * 0	* 0	* 1,00	/ 8760	= 0
Persons E			Invalid input		{	}* or	{	* Not a standard value	} * 0	* 0	* 1,00	/ 8760	= 0
Persons F			Invalid input		{	}* or	{	* Not a standard value	} * 0	* 0	* 1,00	/ 8760	= 0
Persons G			Invalid input		{	}* or	{	* Not a standard value	} * 0	* 0	* 1,00	/ 8760	= 0
Evaporation (person specific)					0	*			-15	* 0	* 1,00	/ 8760	= 0

Lighting / Equipment / Aux. electricity	Useful energy [kWh/a]	Availability	Utilisation period [h/a]	Average heat release
Lighting	0	* 1	/ 8,76	= 0
Office applications (within therm. envelope)	0	* 1	/ 8,76	= 0
Cooking (within therm. envelope)	0	* 0,5	/ 8,76	= 0
Dishwashing (within therm. envelope)	0	* 0,3	/ 8,76	= 0
Cooling (within therm. envelope)	0	* 1	/ 8,76	= 0
Other (within thermal envelope)	0	* 1	/ 8,76	= 0
Auxiliary appliances (see 'Aux Electricity' worksheet)				= 0

Heat loss due to cold water (calculation from column AJ)	On/Off [1 / 0]	Predominant utilisation pattern of building (Data transferred from 'Electricity non-res' worksheet; input 2	Number of WCs (user data)	Amount of WCs: Utilisation of standard values for schools?	Number of WCs (calculation value)	DT: Cold water temp. - Room temp. [K]	Occupied days per year [d/a] 8	Loss daytime [W]	Loss night-time [W]	Availability	Utilisation period [d/a]	Average power cold water
Cold water due to flushing WC			2		2	-7,5	0	* (0	+ -8	) * 1	/ 365	= 0

Total IHG	W	0
Specific IHG	W/m²	0,0
Heat available from internal sources	191 d/a	kWh/(m²a) 0

Primary Energy Renewable PER

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

				Building type:	Maison unifamiliale individuel
				Treated floor area A_{TFA}:	320 m²
				Projected building footprint $A_{Projected}$:	226 m²
Selection of heat generation system	**Contribution margin (useful energy)**			Heating demand incl. distribution & hydr. frost protection	106 kWh/(m²a)
Primary heat generator	**Heating**	**DHW**	**Addl. input in following worksheets**	Cooling energy dem. incl. dehumidification	kWh/(m²a)
6-Direct electrical (heating resistance / continuous flow water hea	100%	0%	-	DHW demand including distribution:	8 kWh/(m²a)
Secondary heat generator (optional)					
5-Direct electric (DHW heat storage)	0%	100%	-		

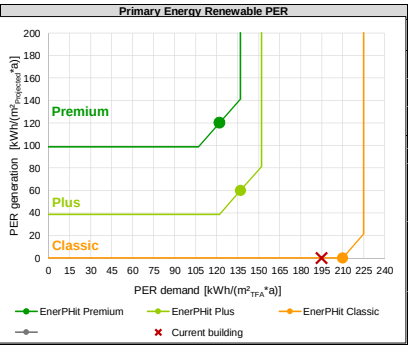
Energy demand	**Final energy**		**PER**			**PE**		**CO_2**	
Reference: Treated floor area	Contribution (final energy)	**Final energy demand**	PER factor	Effective PER factor (including biomass	**PER specific value**	PE factor	PE Value	CO_2 emissions factor (CO_2-eq)	CO_2eq emissions
		kWh/(m²a)	kWh/kWh	kWh/kWh	kWh/(m²a)	kWh/kWh	kWh/(m²a)	kg/kWh	kg/(m²a)
						1-PE-factors (non-renewable) PHI Certification		2-CO2-Factors user determined	
					194,9		318,4		10,8
Heating				1,64	**176,2**	2,60	**279,3**		**9,5**
Electricity (HP compact unit)			1,75			2,60		0,088	
Electricity (heat pump)			1,75			2,60		0,088	
District heating: 20-Gas CGS 70% PHC			2,8|4,5|3,3			0,70		0,000	
Stückgutfeuerung: 44-Wood logs			1,10			0,20		0,000	
Natural gas / RE gas			1,75			1,10		0,250	
Heating oil / RE methanol			2,30			1,10		0,320	
Solar thermal system						0,00		0,000	
Electricity (direct through DHW storage tank)			1,75			2,60		0,088	
Electricity (direct through heating resistance)	100%	106,5	1,75	1,64	174,5	2,60	276,8	0,088	9,4
	0%								
Aux. electricity (vent.winter, frost protection, circ.pump, boiler, wood / pellets)		1,0	1,75	1,75	1,7	2,60	2,5	0,088	0,1
Cooling and dehumidification			1,15		**1,0**		**2,3**		**0,1**
Electricity cooling (heat pump)			1,15			2,60		0,088	
Auxiliary electricity cooling, ventilation summer		0,9	1,15		1,0	2,60	2,3	0,088	0,1
Electricity dehumidification (heat pump)			1,40			2,60		0,088	
Auxiliary electricity (dehumidification)			1,40			2,60		0,088	
DHW generation				1,25	**10,5**	2,60	**21,8**		**0,7**
Electricity (HP compact unit)			1,25			2,60		0,088	
Electricity (heat pump)			1,25			2,60		0,088	
District heating: 20-Gas CGS 70% PHC			2,8|4,5|3,3			0,70		0,000	
Stückgutfeuerung: 44-Wood logs			1,10			0,20		0,000	
Natural gas / RE gas			1,75			1,10		0,250	
Heating oil / Methanol			2,30			1,10		0,320	
Solar thermal system						0,00		0,000	
Electricity (direct)	100%	8,4	1,25	1,25	10,5	2,60	21,8	0,088	0,7
	0%								
Aux. electricity (circ.pump + storage charge, aux.energy DHW + solar DHW)			1,25			2,60		0,088	
Household electricity		**5,8**		1,25	**7,2**		**15,0**		**0,5**
Electricity (household or non-residential lighting, etc.)		5,8	1,25	1,25	7,2	2,60	15,0	0,088	0,5
Auxiliary electricity (other)			1,25			2,60		0,088	
Gas / RE gas dry/cook		**0,0**	1,75		**0,0**	2,60	**0,0**	0,270	**0,0**

Energy generation	**Final energy**		**PER**		**PE**		**CO_2**	
Reference: Projected building footprint area	Final energy generation	**Final energy generation**	PER factor	**PER specific value**	PE factor	PE Value	Emission factor (CO_2-eq)	CO_2eq emissions
	kWh/a	**kWh/(m²$A_{Projected}$*a)**	kWh/kWh	kWh/(m²$A_{Projected}$a)	kWh/kWh	kWh/(m²a)	kg/kWh	kg/a
				0,0		**0,0**		**0,0**
PV electricity	0	0,0	1,00	0,0	-		-	
Solar thermal system	0	0,0	1,00	0,0	1,2	0,0	0,000	0,0
		0,0						

PE demand requirement in case of verification through PE (non-renewable) [kWh/(m²a)]	**229,743681**	**Current building reaches following class for aspect**	**318**	**Requirement met?** **no**

Achievable energy standard through the verification of renewable primary energy (assessment of individual aspects)	**Useful energy, performance**				**Airtightness**
	Annual heat. dem. Treated floor area	**Heating load** Treated floor area	**Useful cool. energy** Treated floor area	**Cooling load** Treated floor area	n_{50}
	kWh/(m²a)	W/m²	kWh/(m²a)	W/m²	1/h
Requirement EnerPHit Premium Requirement EnerPHit Plus Requirement EnerPHit Classic	20		-	-	1,00
Requirement					
Current building reaches following class for aspect	106	45	-	-	5,0
	Unachieved		Unachieved		Unachieved

Summary	**Final energy**	**PER specific value**	**PE Value**	**CO2eq emissions**	**CO_2eq substitution balance**
Though, from the scientific point of view, not entirely correct, different energy carriers will be added together here. This is done to meet the criteria of other energy standards such as Effizienzhaus Plus.			1-PE-factors (non-renewable) PHI Certification	2-CO2-Factors user determined	2-CO2-Factors user determined
	MWh/a	MWh/a	MWh/a	kg/a	kg/a
Demand	**39,2**	**62,3**	101,84	3447	3447
Generation	**0,0**	**0,0**	0,00	0	0
Demand, cumulative generation (annual balance)	39,17	62,33	101,84	3447	3447
Demand w/o household electricity	**37,3**	**60,0**	97,04	3284	3284
Demand w/o household electricity, cum. generation	37,32	60,03	97,04	3284	3284



Passive House compact unit with exhaust air heat pump

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

Calculation based on measured values of the laboratory evaluation for component certification

Building type: **Maison unifamiliale individuelle**

Treated floor area A_{TFA}: **320** m²

				Including DHW connection for washing machines & dishwa	
Covered fraction of space heating demand	*('PER' worksheet)*	**0%**			
Space heating demand + distribution losses	Q_H+Q_{HL}: *(DHW+Distribution)*	**34049**	kWh		
Solar contribution for space heating	$\eta_{Solar,\ H}$ *('SolarDHW' worksheet)*	**0%**			
Effective annual heating demand	$Q_{H,WI}=Q_H*(1-\eta_{Solar,\ H})$	**0**	kWh		
Covered fraction of DHW demand	*('PER' worksheet)*	**0%**			
Total heating demand of DHW system	Q_{gDHW} *(DHW+Distribution)*	**2681**	kWh	**2681**	kWh
Solar contribution for DHW	$\eta_{Solar,\ DHW}$ *('SolarDHW' worksheet)*	**0%**		**0%**	
Effective DHW demand	$Q_{DHW-WI}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$	**0**	kWh	**0**	kWh

Tri: COMME LISTE

Compact unit selection: Go to list of compact units

Measured values from laboratory test

Ventilation

Effective heat recovery efficiency	η_{eff} *(Test stand)*		
Electric efficiency	*(Test stand)*		Wh/m³

Heating

		Test point 1	*Test point 2*	*Test point 3*	*Test point 4*	
Outdoor air temperature	T_{amb}					°C
Measured thermal power heat pump Heating	$P_{HP,Heating}$					kW
Measured COP Heating	$COP_{Heating}$					-

Domestic hot water

		Test point 1	*Test point 2*	*Test point 3*	*Test point 4*	
Outdoor air temperature	T_{amb}					°C
Measured thermal power DHW storage heating-up	$P_{DHW,Heating-Up}$					kW
Measured thermal power DHW storage reload	$P_{DHW,Reload}$					kW
Measured COP DHW storage heating-up	$COP_{DHW,Heating-Up}$					-
Measured COP DHW storage reload	$COP_{DHW,Reload}$					-

Standby (inputs required only if different from storage reload)

		Test point 1	*Test point 2*	*Test point 3*	*Test point 4*	
Outdoor air temperature	T_{amb}					°C
Measured thermal power heat pump Standby	$P_{HP,Standby}$					kW
Measured COP Standby	$COP_{Standby}$					-

0%

Specific heat loss storage incl. connections	$U * A_{Storage}$ *(Test stand)*		W/K	
Average storage temperature in standby mode	$T_{DHW,Standby}$ *(Test stand)*		°C	
Heat pump priority	separate heat pumps	DHW priority		Heating priority
	Room temperature (°C)	**20**		
	Av. ambient temp. Heating P. (°C)	**7**		
	Av. Ground temp (°C)	**12**		
Efficiency SHX exhaust air mixing	η^*_{SHX}			
Heat recovery efficiency SHX exhaust air mixing (if applicable)	$\eta_{SHX,add}$ *(Design Value)*	0%		
Volume flow rate of added exhaust air (if applicable)	V_{add} *(Test stand)*		m³/h	
Hydraulic frost protection				

				Including DHW connection for washing machines & dishwa	
Heat supplied by direct electricity	$Q_{E,dir}$		kWh/a		kWh/a
Space heat supplied by HP	$Q_{HP,Heating}$		kWh/a		kWh/a
Winter DHW supplied by HP	$Q_{HP,DHW,Winter}$	**0**	kWh/a	**0**	kWh/a
Winter standby heat supplied by HP	$Q_{HP,Standby,Winter}$		kWh/a		kWh/a
Summer DHW supplied by HP	$Q_{HP,DHW,Summer}$	**0**	kWh/a	**0**	kWh/a
Summer standby heat supplied by HP	$Q_{HP,Standby,Summer}$		kWh/a		kWh/a
Performance factor of heat generator, DHW & space heating					
Seasonal performance factor	SPF_{H-3}				

		kWh/a	kWh/(m²a)	kWh/a	kWh/(m²a)
Final energy demand heat generation	Q_{final}				
Annual PE demand (non-renewable primary energy)					

	kg/a	kg/(m²a)	kg/a	kg/(m²a)
Annual CO_2-equivalent emissions				

Heat pump

Rénovation EnerPhit - Maison Mr et Mme Sauvage / Climate: Lyon / TFA: 320 m² / Heating: 106,5 kWh/(m²a) / Freq. overheating: 0 % / PER: 194,9 kWh/(m²a)

			Building type:	Maison unifamiliale individuelle	
			Treated floor area A_{TFA}:	320	m²
Covered fraction of space heating demand			*('PER' worksheet)*	0%	
Space heating demand + distribution losses		Q_H+Q_{HL}:	*(DHW+Distribution)*	34049	kWh/a
Solar fraction for space heat		$\eta_{Solar,\ H}$	*('SolarDHW' worksheet)*	0%	
Effective annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$			**0**	kWh/a
Covered fraction of DHW demand			*('PER' worksheet)*	0%	
Total heating demand of DHW system		Q_{gDHW}	*(DHW+Distribution)*	1683	kWh/a
Solar fraction for DHW		$\eta_{Solar,\ DHW}$	*('SolarDHW' worksheet)*	0%	
Effective DHW demand	$Q_{DHW,Wi}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$			**0**	kWh/a
Number of heat pumps in the system				1	
Functionality				Heating & DHW	
Heating					
Selection of HP: None		Heat source:		#WERT!	
Selection of distribution system					
Design distribution temperature		θ_{design}	*(DHW+Distribution)*	#WERT!	°C
Nominal power of distribution system		P_{nom}		0,00	kW
Distribution system (to be completed by experienced users only)					
Nominal power of distribution system		P_{nom}			kW
Radiator exponent		n			
Heat storage tank (buffer storage tank 'DHW+Distribution' worksheet)				0-No	
Specific heat losses storage		U * A $_{Storage}$			W/K
Storage location in thermal envelope				2-Outside	
Room temperature (storage location: outside of thermal envelope)			*(DHW+Distribution)*		°C
Sink temperature of heat pump for heating		θ_{snk}			°C
Entries in relation to the domestic hot water system					
Selection of HP: 0,0		Heat source:			
DHW temperature			*(DHW+Distribution)*	50,00	°C
Orientation of DHW storage tank ('storage 1' in 'DHW+Distribution' worksheet)				2-Outside	
Specific heat losses storage		U * A $_{Storage}$		3,0	W/K
Room temperature (storage location: outside of thermal envelope)			*(DHW+Distribution)*	12,00	°C
Type of backup heater					
Δθ of electric continuous flow water heater					K
Additional options in case of <u>one</u> heat pump for both functions: Heating & DHW					
Same heat pump's sink temperature for Heating and for DHW				1-Yes	
Heat pump priority			*(Manufacturer, tech. data)*		
Control strategy					
Heat pump control strategy				1-On/Off	
Heating					
Depth ground water / Ground collector / Ground probe		z			m
Power of pump for ground heat exchanger		P_{pump}			kW

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Heating

Heat pump: #WERT!

Source: #WERT!

	θ_source °C	θ_sink °C	Heating capacity kW	COP
Test point 1	#WERT!	#WERT!	#WERT!	#WERT!
Test point 2	#WERT!	#WERT!	#WERT!	#WERT!
Test point 3	#WERT!	#WERT!	#WERT!	#WERT!
Test point 4	#WERT!	#WERT!	#WERT!	#WERT!
Test point 5	#WERT!	#WERT!	#WERT!	#WERT!
Test point 6	#WERT!	#WERT!	#WERT!	#WERT!
Test point 7	#WERT!	#WERT!	#WERT!	#WERT!
Test point 8	#WERT!	#WERT!	#WERT!	#WERT!
Test point 9	#WERT!	#WERT!	#WERT!	#WERT!
Test point 10	#WERT!	#WERT!	#WERT!	#WERT!
Test point 11	#WERT!	#WERT!	#WERT!	#WERT!
Test point 12	#WERT!	#WERT!	#WERT!	#WERT!
Test point 13	#WERT!	#WERT!	#WERT!	#WERT!
Test point 14	#WERT!	#WERT!	#WERT!	#WERT!
Test point 15	#WERT!	#WERT!	#WERT!	#WERT!

Temperature difference in sink $\Delta\theta_{Sink}$ #WERT! K

DHW

Heat pump: #WERT!

Source: #WERT!

	θ_source °C	θ_sink °C	Heating capacity kW	COP
Test point 1	#WERT!	#WERT!	#WERT!	#WERT!
Test point 2	#WERT!	#WERT!	#WERT!	#WERT!
Test point 3	#WERT!	#WERT!	#WERT!	#WERT!
Test point 4	#WERT!	#WERT!	#WERT!	#WERT!
Test point 5	#WERT!	#WERT!	#WERT!	#WERT!
Test point 6	#WERT!	#WERT!	#WERT!	#WERT!
Test point 7	#WERT!	#WERT!	#WERT!	#WERT!
Test point 8	#WERT!	#WERT!	#WERT!	#WERT!
Test point 9	#WERT!	#WERT!	#WERT!	#WERT!
Test point 10	#WERT!	#WERT!	#WERT!	#WERT!
Test point 11	#WERT!	#WERT!	#WERT!	#WERT!
Test point 12	#WERT!	#WERT!	#WERT!	#WERT!
Test point 13	#WERT!	#WERT!	#WERT!	#WERT!
Test point 14	#WERT!	#WERT!	#WERT!	#WERT!
Test point 15	#WERT!	#WERT!	#WERT!	#WERT!

Temperature difference in sink $\Delta\theta_{Sink}$ #WERT! K

Electr. energy consumption pump (grnd. water / ground)	$Q_{El,Pump}$		kWh/a
Energy by direct electricity	$Q_{El,dir}$	#WERT!	kWh/a
Space heat supplied by HP	$Q_{HP,Heating}$	#WERT!	kWh/a
Winter DHW supplied by HP	$Q_{HP,DHW,Winter}$	0	kWh/a
Summer DHW supplied by HP	$Q_{HP,DHW,Summer}$	0	kWh/a
Space heating supplied by HP without storage losses	$Q_{HP,Heating}$	#WERT!	kWh/a
Winter DHW supplied by HP without storage losses	$Q_{HP,DHW,Winter}$	0	kWh/a
Summer DHW supplied by HP without storage losses	$Q_{HP,DHW,Summer}$	0	kWh/a
Electrical consumption of HP	Qel_{HP}	#WERT!	kWh/a

		1. HP: Heating or heating & DHW	2. HP: Domestic hot
Seasonal performance factor of heat pump	SPF_{H-1}	#WERT!	######
		kWh/a	kWh/(m²a)
Final electrical energy demand heat generation	Q_{final}	#WERT!	
Annual primary energy demand			
		kg/a	kg/(m²a)
Annual CO_2-equivalent emissions			

Heat pump ground (ground collectors / ground probes)

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Building type: **Maison unifamiliale individuelle**

Treated floor area A_{TFA}: **320** m²

Ground probes

Probe field configuration			A	Individual probe
Length of probe	*('HP' worksheet)*	H	0	m
Probes spacing/distance		B		m
Depth (z=H/2)		z	0	m
Type of probe			A	Double-U
Borehole radius		r_b		m
Inner radius of pipe		r_i		m
Exterior pipe radius		r_a		m
Distance between pipes		B_U		m
Inner radius of pipe casing (only coaxial)		r_{i2}		m
Exterior radius casing pipe (only coaxial)		r_{a2}		m
Thermal conductivity of pipe		λ_R		W/(mK)
Thermal conductivity of back fill		λ_F		W/(mK)
Probe time constant		t_p	#DIV/0!	d
Internal borehole resistance		R_a		Km/W
Borehole resistance		R_b		Km/W

Ground

Soil type		J	0
Density of the ground	ρ_E	0	kg/m³
Thermal capacity of ground	cp_E	0	J/(kgK)
Thermal conductivity of ground	λ_E	0,0	W/(mK)
Soil temperature conductivity	a_E	#DIV/0!	m/s²
Ground temperature gradient	Δ_{TG}	**0,022**	K/m

Brine

Brine (characteristics at 2 °C)		E	0
Density of the brine	ρ_S	0	kg/m³
dynamic viscosity of the brine	η_S	0	kg/(ms)
Heat capacity brine	c_{pS}	0	J/(kgK)
Thermal conductivity of brine	λ_S	0	W/(mK)
Brine - mass flow	m_S		kg/s

Operation type

Waste heat from active cooling to ground probe? Please check, if applicable.

Heat pump operation duration			h/a
Specific heat extraction rate as an annual average	q_{ex}		W/m
	H/R_b		W/K

Ground collectors

Inner radius of pipe	r_i		m
Exterior pipe radius	r_a		m
Thermal conductivity of pipe	λ_r		W/(mK)
Pipe depth	z_{pipe}	0	m
Ground water depth	z_{gw}		m
Pipe spacing	D		m
Base area			m²
Pipe outer surface		#DIV/0!	m²
Pipe length	L	#DIV/0!	m

Brine

Brine (characteristics at 2 °C)		E	0
Density of the brine	ρ_S	0	kg/m³
dynamic viscosity of the brine	η_S	0	kg/(ms)
Heat capacity brine	c_{pS}	0	J/(kgK)
Thermal conductivity of brine	λ_S	0	W/(mK)
Brine - mass flow	m_S		kg/s
Specific heat extraction rate	q_{ex}		W/m²
U * A			W/K

Climate

Period duration	365	d
Average ground surface temp.	T_{m0}	**12,5**	°C
Surface temperature amplitude	T_1	**9,1**	°C
Phase shifting surface	t_{02}	**35**	d

Ground characteristics

		Thermal conductivity [W/(mK)]	Density [kg/m³]	Heat capacity [J/(kg K)]	Heat capacity [MJ/(m³ K)]	Thermal conductivity [10^{-7} m²/s]	Source
A	Sand, 9% moisture	0,980	1440	1507	2,170	4,520	[Neiß 1977]
B	Sand, 13% moisture	1,500	1600	1800	2,880	5,210	[Neiß 1977]
C	Ground, coarse gravel	0,520	2000	1840	3,680	1,410	[VDI 1984]
D	Loam, 36% moisture	2,300	1650	2847	4,700	4,900	[Neiß 1977]
E	Clay	1,280	1500	880	1,320	9,700	[VDI 1984]
F	Clay / Silt	2,200	2550	882	2,250	9,780	[VDI 2000]
G	Slate	2,100	2700	870	2,350	8,940	[VDI 2000]
H	Silt	1,500	1920	2938	5,640	2,660	[ISO 13370]
I	Rock	3,500	2500	2500	6,250	5,600	[ISO 13370]
J							

Properties of the brine

		Temperature [°C]	Density [kg/m³]	Heat capacity [J/(kg K)]	Thermal conductivity [W/(mK)]	Dynamic viscosity [kg/(ms)]
A	Ethylene glycol 25%	2	1052	3950	0,480	0,0052
B	Potassium carbonate	2	1265	2941	0,544	0,0031
C	Potassium formate	2	1226	3190	0,534	0,00237
D	Water	2	997	4190	0,590	0,001307
E						

Result ground probe calculation

Month	Borehole temperature °C
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Boiler (gas, oil and wood)

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Building type:		Maison unifamiliale individuelle	
Treated floor area A_{TFA}:		320	m²
Covered fraction of space heating demand	('PER' worksheet)	0%	
Space heating demand + distribution losses	Q_H+Q_{HS}: (DHW+Distribution)	34049	kWh
Solar contribution for space heating	$\eta_{Solar,\ H}$ ('SolarDHW' worksheet)	0%	
Effective annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$	**0**	kWh
Space heating demand without distribution losses	Q_H ('Verification' worksheet)	34049	kWh
Covered fraction of DHW demand	('PER' worksheet)	0%	
Total heating demand of DHW system	Q_{gDHW} (DHW+Distribution)	2681	kWh
Solar contribution for DHW	$\eta_{Solar,\ DHW}$ ('SolarDHW' worksheet)	0%	
Effective DHW demand	$Q_{DHW,Wi}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$	**0**	kWh

Boiler type		30-Firewood pieces (direct and indirect heat emission)	
Fuel		44-Wood logs	
PER factors (renewable primary energy)	('Data' worksheet)	1,10	kWh_{PER}/kWh_{Final}
PE factor (non-renewable primary energy)	('Data' worksheet)	0,20	kWh_{PE}/kWh_{Final}
CO_2 emissions factor (CO_2-equivalent)	('Data' worksheet)	0,000	g/kWh
Useful heat provided	Q_{Use}		kWh/a
Max. heating power required for heating the building	P_{BH} ('Heating load' worksheet)	14,48	kW
Length of the heating period	t_{HP}	4577	h
Length of DHW heating period	t_{DHW}	8760	h

Use characteristic values entered (check if appropriate)?

		Project data		Standard values		Input field	
Design output	P_{nom} (Rating plate)	15	kW	15	kW		
Installation of boiler (Outdoor: 0, Indoor: 1)		0		0			
Input values (oil and gas boiler)		Project data		Standard values		Input field	
Boiler efficiency at 30% load	$\eta_{30\%}$ (Manufacturer)						
Boiler efficiency at nominal output	$\eta_{100\%}$ (Manufacturer)						
Standby heat loss boiler at 70 °C	$q_{B,70}$ (Manufacturer)						
Average return flow temperature measured at 30% load	$\vartheta_{30\%}$ (Manufacturer)		°C				
Input values (biomass heat generator)		Project data		Standard values		Input field	
Efficiency of heat generator in basic cycle	η_{GZ} (Manufacturer)	60%		60%			
Efficiency of heat generator in steady-state operation	η_{SO} (Manufacturer)	70%		70%			
Average fraction of heat output released to heating circuit	$z_{HC,m}$ (Manufacturer)	0,4		0,4			
Temperature difference betw. power-on and power-off	$\Delta\vartheta$ (Manufacturer)	30	K	30	K		
In case of inside installation: area of installation room	$A_{install}$ (Project)	0	m²	0	m²		
Useful heat output per basic cycle	$Q_{N,GZ}$ (Manufacturer)	22,5	kWh	22,5	kWh		
Average power output of the heat generator	$Q_{N,m}$ (Manufacturer)	15,0	kW	15,0	kW		
Heat generator with built in conveyor for pellets						x	
Unit only with regulation (no fan / no starting aid)							
Auxiliary energy demand for a basic cycle	$Q_{HE,GZ}$ (Manufacturer)	0,32	kWh	0,32	kWh		kWh
Power consumption in steady-state operation	$P_{el,SB}$ (Manufacturer)	160	W	160	W		W

Utilisation factor of heat generator space heating	$\eta_{H,g,K}=f_j*h_{k'}$	0%
Utilisation factor heat generator DHW	$\eta_{DW,g,K}=h_{100\%}/f_{j,DW}$	0%
Utilisation factor heat generator DHW & space heating	$\eta_{g,K}$	0%

		kWh/a	kWh/(m²a)
Final energy demand space heating	$Q_{Final,HE}$ = $Q_{H,wi}$* $e_{H,g,K}$	0	
Final energy demand DHW	$Q_{Final,TW}$ = $Q_{DHW,wi}$* $e_{TW,g,K}$	0	
Total final energy demand	Q_{Final} = $Q_{End,HE}$ + $Q_{End,TW}$	0	0,0
Annual PE demand (non-renewable primary energy)		0	0,0
		kg/a	kg/(m²a)
Annual CO_2-equivalent emissions		0	0,0

District heating and combined heat power (CHP)

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Building type:		Maison unifamiliale individuelle	
Treated floor area A_{TFA}:		320	m²
Covered fraction of space heating demand	*('PER' worksheet)*	0%	
Annual heating demand kWh/a	Q_H *(DHW+Distribution)*	34049	kWh
Solar contribution for space heating	$\eta_{Solar,\ H}$ *('SolarDHW' worksheet)*	0%	
Effective annual heating demand	$Q_{H,Wi}=Q_H*(1-\eta_{Solar,\ H})$	0	kWh
Covered fraction of DHW demand	*('PER' worksheet)*	0%	
DHW demand	Q_{DHW} *(DHW+Distribution)*	2681	kWh
Solar contribution for DHW	$\eta_{Solar,\ DHW}$ *('SolarDHW' worksheet)*	0%	
Effective DHW demand	$Q_{DHW,Wi}=Q_{DHW}*(1-\eta_{Solar,\ DHW})$	0	kWh

	PE factor (non-renewable)	CO_2 emissions factor (CO_2-eq)
	kWh_{PE}/kWh_{Final}	kg/kWh
Definition of heat source for PE factor and CO_2 emissions	0,70	0,000

Definition of heat source for PE factor and CO_2 emissions: 20-Gas CGS 70% PHC

Definition of heat source for calculation of PER factor

Heat net — Efficiency district heating net:

PHC complex & boiler for peak loads	Fraction	Efficiency Electricity	Efficiency Heat
PHC complex			
Boiler for peak loads	100%		
Total	100%		

	PER factors	PER factors
Within biomass budget	1,10	2,80
Excess of biomass budget	1,75	4,50
DHW Summer	1,25	3,30

Performance ratio of heat transfer station	$h_{a,HX}$		
Utilisation factor of heat transfer station	$\eta_{a,SHX}$	0%	

		kWh/a	kWh/(m²a)
Final energy demand heat generation	Q_{final} = Q_{Use}* $e_{a,DH}$	0	0,0
Annual PE demand (non-renewable primary energy)		0	0,0
		kg/a	kg/(m²a)
Annual CO_2-equivalent emissions		0	0,0

Table of PER and PE factors as well as CO_2-equivalent emission factors of different energy carriers and uses from different sources

			Transfer to 'PER' works	
Energy type	Number	Energy carrier	PER-factor	1-PE-factors (non-renewable) PHI Certification
			$kWh_{prim-el}$/ kWh_{Final}	kWh_{prim}/ kWh_{Final}
	10	None		
Fuel source	20	Heating oil	*2,30*	1,10
	30	Natural gas	*1,75*	1,10
	31	LPG	*1,75*	1,10
	41	Hard coal	*2,30*	1,10
	42	Brown coal	*2,30*	1,20
	32	Biogas	*1,10*	1,10
	21	Pyrolysis oil or bio oil	*1,10*	1,10
	43	Wood	*1,10*	0,20
	44	Wood logs	*1,10*	0,20
	50	Pellets	*1,10*	0,20
	46	Forest woodchips	*1,10*	0,20
	47	Poplar woodchips	*1,10*	0,20
	33	RE-Gas	1,75	
	22	RE-Methanol	2,30	
	48	Biomass	1,10	
Electricity	60	Electricity-mix		2,60
	61	Electricity mix from CHC		2,50
	00	Primary electricity	1,00	
	01	Household electricity	1,25	2,60
	02	Electricity for DHW	1,25	2,60
	03	Electricity for heating	1,75	2,60
	04	Electricity for cooling	1,15	2,60
	05	Electricity for dehumidification	1,40	2,60
	06	Platzhalter_EE-Stromanwendung	-	2,60
	62	Electricity from photovoltaics	*1,00*	0,00
	63	Monocrystalline photovoltaic electric	*1,00*	0,00
	64	Polycrystalline photovoltaic electric s	*1,00*	0,00
	65	Onshore wind power	*1,00*	0,00
	66	Offshore wind power	*1,00*	0,00
	67	Hydroelectric power station > 10MW	*1,00*	0,00
Environmental energy, solar thermal energy	71	Ground heat, geothermal energy	0,00	0,00
	72	Ambient high temperature	0,00	0,00
	73	Ambient low temperature	0,00	0,00
	80	Solar thermal flat plate collector (ger	*1,00*	0,00
	81	Solar thermal evacuated tube collect	*1,00*	0,00
	74	Waste heat	0,00	0,00
User defined energy carrier (for generation, please enter	98	**Eigener Energieträger**		
user defined factords for demand in columns N and O)	99			
	1	1-None		0,00
District heat	10	10-Hard coal CGS 70% PHC		0,80
	11	11-Hard coal CGS 35% PHC		1,10
	12	12-Hard coal CGS 0% PHC		1,50
Gas CGS	20	20-Gas CGS 70% PHC	Calculation	0,70
	21	21-Gas CGS 35% KWK	in	1,10
	22	22-Gas HS 0% PHC	'District	1,50
Heating oil-EL CGS	30	30-Oil CGS 70% PHC	heating'	0,80
	31	31-Oil CGS 35% PHC	worksheet	1,10
	32	32-Oil CGS 0% PHC		1,50
District heating: User determined	40	**40-Eigene Eingabe: 90% KWK**		0,80
District heating combined heat power (CHP)	13	Fossil fuel		0,70
	14	Renewable fuel		0,00
District heating from heating station	15	Fossil fuel		1,30
	16	Renewable fuel		0,10

Heat generator				x) Gas will be used
No.	Type	Fuel ('Comparison' worksheet)		
1	1-None			
10	10-Improved gas condensing boiler		1	x
11	11-Improved oil condensing boiler		2	
12	12-Gas condensing boiler		1	x
13	13-Oil condensing boiler		2	
20	20-Low temperature boiler gas		1	x
21	21-Low temperature boiler oil		2	
30	30-Firewood pieces (direct and indirect heat emission)		3	
31	31-Wood pellets (direct and indirect heat emission)		4	
32	32-Wood pellets (only indirect heat emission)		4	
40	40-Reserve			

Dishwashers and washing machines
1-DHW connection
2-Cold water connection

Clothes drying	Availability electricity	Availability evaporation
1-Clothes line	1	1
2-Drying closet (cold!)	1	1
3-Drying closet (cold!) in extract air	0,9	0,9
4-Condensation dryer	0,7	0
5-Electric exhaust air dryer	1	1
6-Gas exhaust air dryer	1	1

Cooking	Electric fraction	PE factor	CO_2 factor	PER-factor
1-Electricity	100%	2,60	0,09	1,25
2-Natural gas	0%	1,10	0,25	1,75
3-LPG	0%	1,10	0,27	1,75